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THE METAL INDUSTRY

WITH WHICH ARE INCORPORATED
THE ALUMINUM WORLD. THE BRASS FOUNDER AND FINISHER
AND ELECTRO-PLATERS REVIEW.

A TRADE JOURNAL RELATING TO THE NON-FERROUS METALS AND ALLOYS.

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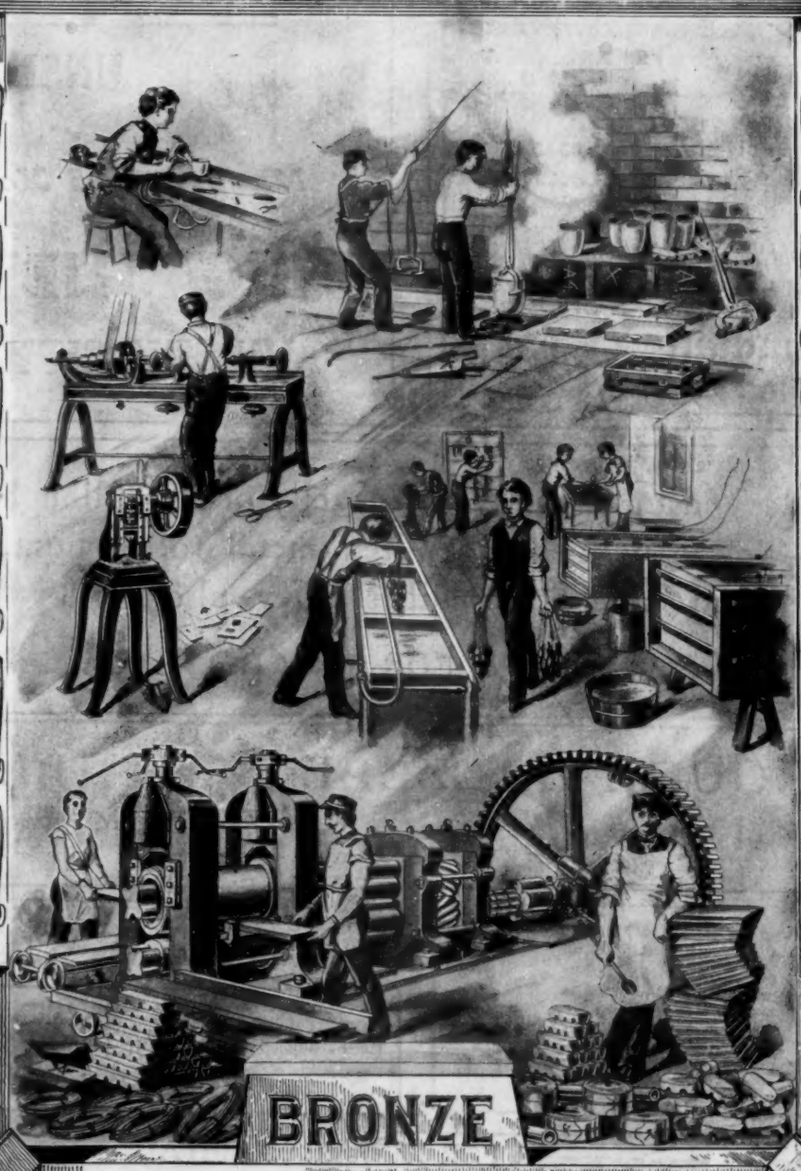

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THE ALUMINUM INDUSTRY.

Within recent years the use of aluminum in the various branches of the metal industry has increased marvelously. It is quite easy to remember the time when the metal was yet a drug in the market, and the many struggles and vicissitudes through which the producers of aluminum had to pass before the metal firmly established itself as an indispensable raw material for metal users. There is no doubt that the recognition of the value of the properties of aluminum was to a large extent delayed by the extravagant claims which in the beginning of the production of the metal were made for it. At the present time, however, it has found its proper and distinct place in many branches of the metal manufacturing industry into which it has been introduced. In order to comprehend the extent to which aluminum, for instance, is used in the automobile industry, which itself is only of a comparatively short existence, it needed but a visit to the two automobile shows which were recently held in New York. Many of the aluminum castings shown at those exhibitions were very intricate and were a great credit to the founders' art.

On account of this great demand for aluminum, the only producer of the metal in this country, the Pittsburg Reduction Company, has not been able to keep up with the demand and at present there exists a great scarcity of the metal. In some cases it is even impossible for a consumer to get aluminum at any price, and some have even resorted to the expedient of importing it from Europe. This, however, is a very expensive procedure and it is not even possible to obtain any considerable quantities from that source.

One of the most important events, as far as the aluminum industry is concerned, took place on April 2d of this year, when the patent of Mr. Charles M. Hall, which was granted to him on April 2, 1889, and under which it was possible for the Pittsburg Reduction Company to assume a practical monopoly of the production in the United States, will become public property by the expiration of the patent. It will be remembered that this patent, which became of fundamental importance for the commercial production of aluminum, protected the use of an electrolyte composed of cryolite as a solvent for bauxite, and this electrolyte had the most important property of being easily fusible. The subsequent extension of the

manufacture of aluminum and the three-cornered litigation about patent rights between the Pittsburg Reduction Company, as owners of the Hall patent, and the Electric Smelting and Aluminum Company, the moving spirits of which were the well-known pioneers in the aluminum industry, the Cowles brothers, as owners of the Bradley patent, and, in the third place, Grosvenor P. Lowrey, is sketched fully at another place in this issue.

What effect the expiration of the Hall patent will have on the aluminum industry it is yet too early to foretell. There is no doubt that owing to the scarcity and high prices of the metal, efforts will be made to start competing works after the Hall electrolyte becomes public property, and in fact, there are many rumors of such proceedings already in the air. Whether they will take tangible shape remains to be seen. As far as the Pittsburg Reducion Company itself is concerned, it must be remembered that though its electrolyte is public property, yet, its method of operation is protected by the Bradley patent which will not expire until February 2, 1909. The Bradley patent is of fundamental importance for the manufacture of aluminum, covering as it does the use of the current as well for the purpose of keeping the electrolytic bath in a molten condition as for effecting its decomposition and setting the aluminum free at the cathode. It has been claimed variously that Mr. Hall never succeeded in producing aluminum commercially until he abandoned the method of conducting the electrolysis in a vessel heated from the outside by an exterior source of heat. If that will hold true, it seems to be very difficult for other people to get around the claims of the Bradley patent, in spite of their having an electrolyte of the proper nature. Moreover, the Pittsburg Reduction Company has the immense advantage over its competitors of a large, well-equipped plant, trained workmen, and an experience of a number of years' duration, and is making strenuous efforts to enlarge its productive capacity.

What, in view of the above considerations, will be the future development of the aluminum industry is difficult to say. No doubt, if competition would be successful, the price of the metal would fall down to a greater or less extent. As far as the Pittsburg Reduction Company is concerned, it must, however, be said that they have never abused their privilege of having a monopoly, for the purpose of putting a prohibitory price on the metal.

DUTY UPON METAL ALLOYS.

A recent decision by the United States Circuit Court of Appeals involved the question of duty upon a metal alloy which was composed of 62 per cent. of iron, 32 per cent. of tin, and 6 per cent. of manganese, and which is used as a hardener in the manufacture of manganese bronze. The Customs officials at the Port of New York had claimed that this metal should pay a duty of 8 cents per pound and be classed an alloy of aluminum according to paragraph 172 of the Tariff Law of July 24th, 1897. The metal was imported by the Wm. Cramp & Sons' Ship and Engine Building Company, who protested against the classification, contending that as the alloy contained no aluminum, it should pay a duty of 20 per cent. according to paragraph 183 of the same Tariff Law under the head of a metallic substance in a crude state or unwrought metal. The United States Circuit Court had decided in favor of the Cramp Company but the case was appealed by the Government to the above-mentioned court which confirmed the decision of the lower court. The case was then referred by the Government to the Attorney General of the United States and the latter just rendered an opinion advising the Treasury Officials not to take the case to Supreme Court as the latter would in all probability sustain the lower courts. In accordance with this decision, therefore, the excess of duty collected on the alloy will be refunded by the Government and it will be henceforth assessed at 20 per cent.

ADDITIONS TO THE PLATING BATH.

In the department of Criticism and Comment of this issue of THE METAL INDUSTRY there appears a communication which every plater would do well to read over carefully and take to heart. It refers to the unintelligent use of information imparted by persons not familiar with the subject. It is quite surprising how much of this sort of thing is still being done and the case cited by our correspondent is by no means an isolated one. Every plater should realize what a sensitive thing the plating bath is and how quickly it can be spoiled or improved by comparatively small additions of various substances. Many a good bath has been spoiled by adding ingredients indiscriminately, as would have been the case in the instance quoted by our correspondent if he had not come to the rescue. There are still many among the plating fraternity who do not seem to realize what effect the addition of small quantities of reagents, and especially of acids and alkalies, has upon chemical and particularly upon electro-chemical reactions, such as occur in the plating bath. They seem to think that they cannot obtain good results unless they make additions in liberal doses and thus run the chance of either spoiling the bath or getting no results at all. The proper way to proceed is, of course, to experiment, when an addition of a chemical is suggested, and to start with a very small amount first and increase it successively, noting the improvement in the results until the desired effect is obtained. It must be said, however, that cases like that quoted above are rarer than they were in former years, as the plating business is progressing rapidly and platers abandon the old haphazard methods and acquire a good understanding of the theoretical principles underlying their art.

Clear collodion lacquers are not very adhesive on silver plated goods and often come off in long shreds. By adding ¼ part of French varnish cut in wood alcohol and ¼ part of a mixture of equal parts of amyl acetate and fusel oil, the transparent lacquers in use will be found more adhesive without affecting the color of the lacquer to any extent.

HIGH LEAD BRONZES.

By Jesse Jones.

Considerable interest is at present being manifested in bronzes containing from fifteen to fifty per cent. of lead. Quite a number of patents have been taken out on these bronzes and it is often a matter of wonder to the mind of a person of average intelligence as to just what constitutes novelty in the eyes of the Patent Office examiner. Bronzes containing from fifteen to thirty per cent. of lead were made in China and elsewhere before America was discovered, and numerous analyses proving this have been published. Of course, the makers of these ancient lead bronzes produced them by accident rather than by design, and their success was due to impurities in the ores used, such as antimony, iron, nickel, etc.

In order that a large amount of lead may be retained by a bronze without any marked segregation, it is necessary that some metal or metalloid be present that will cause the molten mass to congeal very quickly, so as to retain the lead enmeshed, although the casting may be still at a temperature much above the melting point of lead. Among the substances that are capable of exercising this influence are antimony, iron, manganese, sulphur, nickel and phosphorus or phosphor tin. A few mixtures are given below which will show the amount of congealing element that it is necessary to have present.

Antimony Lead Bronze.—Copper, 75 pounds; lead, 20 pounds, and antimony, 5 pounds. The antimony is generally added in the form of anitimonial lead. This is a well-known acid metal, but it is little used as a bearing bronze.

Iron Lead Bronze.—The Manganese Brass and Bronze Company, makers of the well-known Parsons' manganese bronze No. 2, have also what is called manganese bronze No. 4, which contains:

Copper	76½ pounds.
Lead	14½ pounds.
Tin	8½ pounds.
Iron	½ pound.
Manganese	None.

Well alloyed, this makes an excellent bearing bronze, but if any of the iron present remains uncombined, it will cut a steel journal like a diamond. This alloy has a shrinkage in twelve inches of .165 inches. The tensile strength is 26,700 pounds, the elastic limit, 19,600 pounds; the elongation, 10 per cent. in two inches, and the reduction of area 11.6 per cent. The cold bending test is 42 degrees.

A photomicrograph is given in Fig. 1 of the hardener used in making the manganese bronze No. 4, the magnification being fifty diameters.

Manganese Lead Bronze.—This alloy contains:

Copper	100 pounds.
Lead	30 pounds.
Tin	10 pounds.
Black oxide of manganese	1 pound.
Borax	2 ounces.

Very often castings made from this formula are a heterogeneous mixture of copper and lead rather than a uniform alloy, and this is especially liable to happen if pure materials are used. It is, perhaps, a fortunate thing for the makers of lead bronzes that they, as a rule, use nothing but scrap metals, off-grade tin, tea and antimonial lead, etc., for these are the very things needed to prevent the lead sweating out from the castings made. When good results are obtained from the above mixture, it is likely to be due to the iron, antimony, etc., that are present as impurities, rather than to the black oxide of manganese used.

Sulphur Lead Bronze.—The Westinghouse Machine Company used for some time a lead copper bronze, containing:

Lead	50 pounds.
Copper	50 pounds.
Sulphur	½ pound.

It was finally abandoned on account of the lack of uniformity, because no one else could get it uniform but the inventor.

Nickel Lead Bronze.—This bronze is made with various amounts of lead running from 25 to 60 per cent. Perhaps the most satisfactory of any of these alloys made with the aid of nickel is the well-known plastic bronze. It is said to have the following analysis:

Copper	64.00
Lead	28.00
Tin	5.50
Nickel	1.83
Iron	.35

Its shrinkage is .194 inches to the foot and the specific gravity 9.037. The tensile strength is 19,000 pounds, the elastic limit 6,500 pounds, the elongation in two inches 17 per cent., and the reduction of area 10.5 per cent. The electrical conductivity is 12, compared to copper as 100. Electrical conductivity generally follows the heat conductivity very closely. For the cool running of the bearing, it is important to have the heat conductivity as high as it is consistent with the other qualities aimed for, and also to have a large radiating surface.

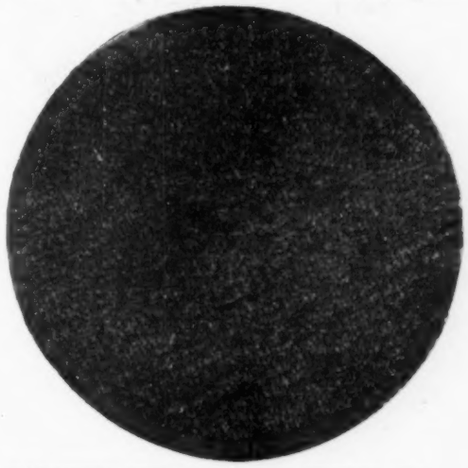


FIG. 1. HARDENER FOR MANGANESE BRONZE, NO. 4. MAGNIFICATION 50 DIAMETERS.

Strange as it may seem, the lead in plastic bronze is more likely to separate when the alloy is poured at a low temperature than when it is poured at a higher heat, and there is more separation in ingots cast in iron than in those cast in sand molds. Perhaps, one reason for casting the ingots in sand molds is the richer color that they are thus given. Indeed, it is impossible to believe they contain so much lead.

Plastic bronze is coming into use quite largely for slide valves of locomotives, rolling mill bearings, etc. Very large bearings are made in it without separation. One of the large rolling mills in the Wheeling district has a set of blooming mill bearings made from this alloy, the top bearing weighing 1,200 pounds and the bottom bearing,

2,000 pounds. Plastic bronze is made either with or without nickel and its excellence is due, no doubt, in a great measure to the skill used in perfectly alloying the original ingot.

If the well-mixed ingot is obtained, almost any brass foundry with average equipment can turn out bearings successfully in this alloy. Fig. 2 shows an imperfectly mixed sample of plastic bronze, the lead being in pools, while Fig. 3 shows a well-mixed sample.

Phosphorus Lead Bronze.—It is not intended to refer to the ordinary standard phosphor bronze in this connection, but to those alloys containing about 50 per cent. of lead. The late Mr. Joseph Richards of the Delaware Metal Refinery of Philadelphia, who was one of the best informed metallurgists in the country, told the writer that a 50 per cent. lead and 50 per cent. copper alloy was

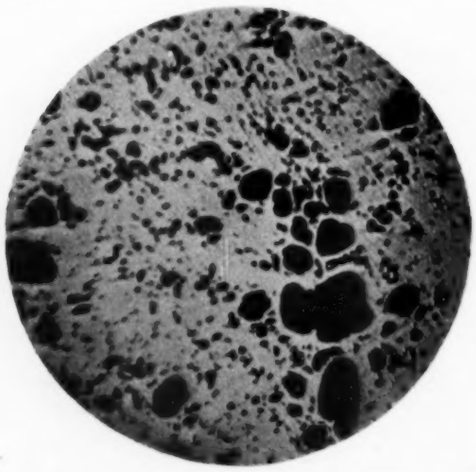


FIG. 2. PLASTIC BRONZE, IMPERFECTLY MIXED, MAGNIFICATION 50 DIAMETERS.

used in New York as early as 1877 for making door knobs, etc., under the name of "Albertis" metal. It had a white color when first cast, but soon acquired a rich copper color. Mr. Richards gave the mixture as,

Copper	50 pounds.
Lead	50 pounds.
Cyanide of potash	8 ounces.
Phosphorus	4 ounces.

This alloy is at present being used to some extent in bearings of tug boats on the Delaware River and is said to give satisfaction.

The writer examined an eccentric strap bearing that was removed from the steamship New York during a general overhauling of that steamer in 1901, and it had every appearance of giving satisfactory service. On melting up this bearing and casting it into thirty-pound ingots, the ingots when sawed through the center showed no segregation of lead.

United States patent No. 671,595, issued to James E. Hewitt, April 9, 1901, claims as new an alloy consisting principally of lead and copper in equal proportions and containing a small percentage of phosphorus and tin. This alloy has a high melting point (about 1,500° F.), and yet in many respects resembles a babbitt, being rather soft. Bearings made from it may become quite hot and still give good service, while babbitt metal would melt and run out. Some of the mills of the Pittsburg district use it for hot neck rolls. In pouring it, cold mandrels are often used instead of hot ones, with the result that the lead sweats more or less. Still the mills get good service from the bearing and seem satisfied. The specific gravity of the alloy is 9.345. The tensile strength, 15,000 pounds; elastic limit, 6,500 pounds; elongation in two inches, 12½ per cent; reduction of area, 12½ per cent.

The secret of making any of the high lead bronzes is in the manipulation rather than in the mixture used. If either the copper or lead are allowed to oxidize to any extent they will not amalgamate. The copper must be hot and well protected by lime or other suitable cover combined with a reducing agent, such as argol or pulverized charcoal. In certain situations the new deoxidizer, magnesium, may be of service also.

It is hardly possible at the present time to judge whether any of these high lead bronzes will displace the ordinary standard phosphor bronze, which is more extensively used for bearings than any other mixture. For some special uses they may be desirable, but it is the opinion of the writer that when the standard phosphor

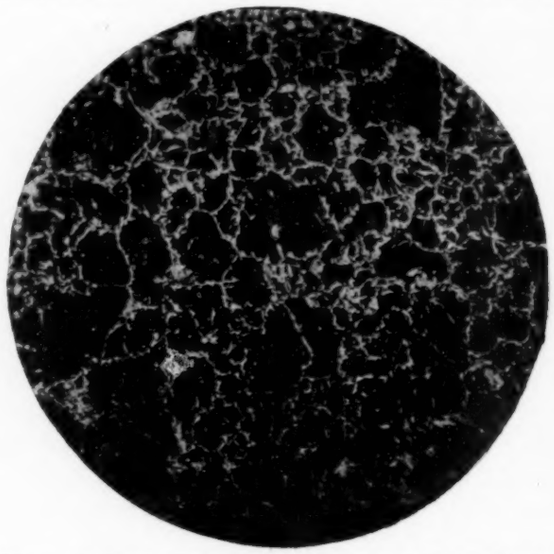


FIG. 3. PLASTIC BRONZE, WELL MIXED, MAGNIFICATION 50 DIAMETERS.

bronze is well made, its rigidity and the ease with which it may be manipulated in the foundry gives it many points of advantage over any of the alloys that have been named above.

DISTILLING PLATINUM.

A correspondent of the Frankfurter Zeitung writes from Paris that at the last meeting of the Paris Academy of Sciences the well-known French chemist, Henri Moissan, reported with reference to his experiments of distilling platinum and platinum metals. With an electric current of 500 amperes and 110 volts he succeeded in distilling from 20 to 50 grains of platinum in a few minutes. The vaporization of the platinum took place at the high temperature as quietly as, for instance, the evaporation of water at 100°. The platinum condensed in brilliant little plates and cubiform crystals. The molten lime became gray colored from the condensed platinum vapors. Mr. Moissan also distilled other platinum metals—osmium, ruthenium, palladium, iridium, and rhodium. (U. S. Consular Reports.)

A new pyrometer has been brought out by Professor Fery, of Paris, France. It is in principle a thermo-electric instrument, but differs from other forms in the method of heating the thermo-electric couple. The couple consists of a small iron and a small constantan wire, and it is heated by focusing upon it the image of the body, the temperature of which is to be measured.

THE USE OF THE VIBRATOR IN THE BRASS FOUNDRY.

By J. Wilson.

The need of some sort of a device for rapping patterns in a mold has brought out many mechanical devices in the last 20 years. While most of these devices, too numerous to mention, have accomplished their purpose, yet they are too expensive to manufacture and consequently they never reached the market. Not only were they expensive but they were also slow in operating, and not till 1895 was any success attained in this line. Then Harris Tabor, of the Tabor Manufacturing Company, built the first vibrator machine, and later brought out the aluminum frame to which was attached a vibrator such as shown in Fig. 1, now being manufactured and sold by the Tabor Manufacturing Company, of Philadelphia, Pa.

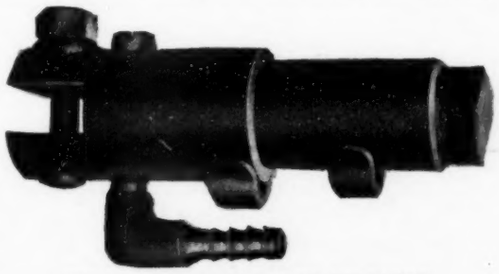


FIG. 1. THE FIRST TABOR VIBRATOR.

These vibrators are made with the greatest care, and are equal in workmanship and material to the best pneumatic tool. A piston of hardened steel vibrates within a steel cylinder and strikes a rapid succession of blows (between 10,000 and 30,000 per minute), which are communicated to the pattern when ready to draw.

In the last few years two other kind of vibrators have come out, namely, the Centrifugal and the Electrical. The Swift Centrifugal vibrator, though not so commonly used, has points of advantage over the other air tools.

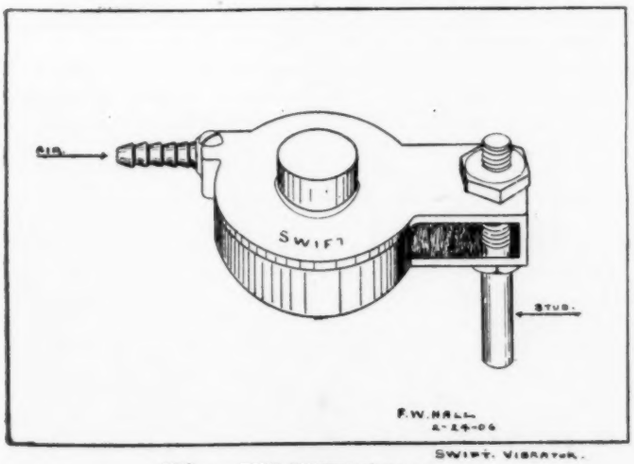


FIG. 2. THE SWIFT VIBRATOR.

Its construction is such, that when air is applied to the inner weighted wheel, it rapidly revolves around a center stud. The wheel being heavier on one side than the other, causes it to pull hard away from the center stud, thus producing a heavy vibration of the stud. This vibration is then transmitted to the patterns or frame to which the device is attached. The construction of this vibrator is such that sand falling on it will not stop it from working. These appliances have been known to run for months without any care whatever. This cannot be said of any other vibrator, and it is a point much appreciated by the users. The leading advantage of this vibrator over others is the fact that it distributes the vibration over the patterns and the plate to which the patterns are attached more evenly than any other air vibrator on the market. It takes it a little longer in getting started and also in stopping than it does other makes, but as far as the stopping is concerned this is an advantage, inasmuch as it acts on the patterns just like the last few light raps which the molder gives to his rapping bar when molding by hand. It has a tendency to bring the patterns back in the center of the cavity in the mold. The centrifugal vibrator is made and sold by W. R. Swift, of Philadelphia, Pa.

The electrical vibrator is less known than the centrifugal vibrator, and has no points of advantage over other makes unless it be in the fact that it can be installed and operated from city power mains, and thus save the installing of a power plant, which is necessary with the air-operated vibrators.

FIG. 3. THE PAXSON VIBRATOR.

There are three firms manufacturing these vibrators for the market, viz., the Tabor Manufacturing Company, the E. H. Mumford Company, and the J. W. Paxson Company, all three of Philadelphia, Pa. The Mumford vibrator is similar to the Tabor, but in attaching it to the pattern or plates of patterns it is fixed in a vertical position and thus gives a more even vibration to the pattern, yet not so much of it.

The J. W. Paxson Company, of Philadelphia, Pa., have brought out a vibrator which works by compressed air and is made up of a hardened hammer within a cylinder, differing from the Tabor or the Mumford types in that its air passages are constructed differently and the air enters from the end instead of the sides. This type and the Tabor type can both be mounted vertically like the Mumford if desired.

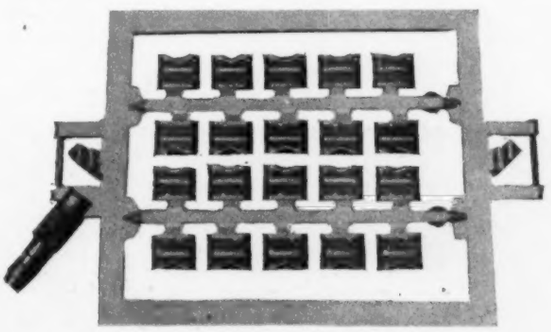


FIG. 4. THE TABOR VIBRATOR FRAME.

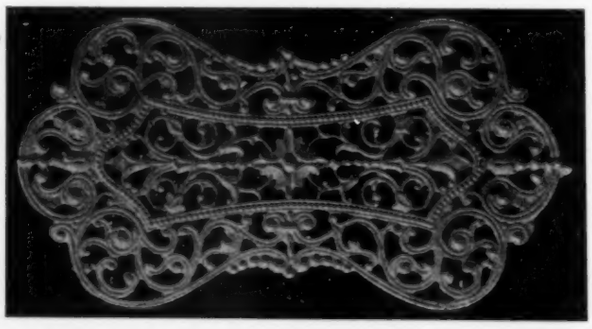
In the brass foundry, where the molders work on the tub, these pneumatic vibrators are attached to the sides of the tub in such a fashion as to give the molder a chance to start them going when he is ready to draw the pattern without calling the next molder to his aid to rap the side of his tub. The larger sizes of vibrators are used for this purpose. When foundrymen are using vibrator frames such as shown in Fig. 4, they use their regular hand patterns, only gated. The ends of the gates are attached to the sides of the frames as will be seen in the illustration. Then a hard match is made and the job worked with a snap flask as before, as only the fittings on the end of the

flask are changed. Fittings which are especially made to work in the fitting on the frame are screwed on the flask. This outfit is then worked in conjunction with a power ramming machine which does the ramming of the mold, namely, first of the drag, while resting on the hard match, and then of the cope while resting on the drag. A knee pad on the front of the machine allows the molder to operate the vibrator, which is attached on one side of the frame, while he lifts off the cope. Then he gives another shove of the knee pad and he draws the pattern frame and patterns all at one time, only letting the vibrators run long enough to free the pattern from the sand. This frame is then hung on a hook in front of the machine above the drag, while he closes the cope on the drag. The openings in the end of the mold are shut off by inserting the fingers in it when it rests on the floor, where snap flasks are used. Iron flasks can be used if so desired.

When the nature of the work is such as to allow the cope and the drag to be rammed simultaneously, the patterns are mounted on a back board. This method is one of the quickest known and was first used by Mr. W. T. Clark and patented by him. A paraffine board is employed, generally made of oak or ash, as they are open-grained woods and absorb the paraffine freely. The wood is boiled in crude paraffine for about 10 hours and is then allowed partially to cool therein. The paraffine displaces the air in the pores of the wood, increases its specific gravity and protects it absolutely against the swelling action of the moisture. These plate or boards of ordinary sized flasks fitted to the frame can be bought from the Tabor Manufacturing Company, of Philadelphia, Pa.

METHOD OF FORMING MOLDS FOR CASTING PURPOSES.

A mold by the use of which delicate outlines and designs may be reproduced from the pattern has recently been patented by J. G. Weyer, of Providence, R. I. The mold is composed of calcined plaster of paris and finely screened coal ashes mixed together. In forming the mold the plaster of paris is mixed with water to about the consistency of a thick cream. Then the finely sifted ashes are mixed with water to about the same consistency and the two substances are mixed together in about equal proportions. The material is then poured around the pattern and forms a mold in two halves, in the same manner as plaster molds are made, namely, first one half and then the other.



STERLING SILVER CAST IN PLASTER ASH MOLD.

When the mixture is poured around the first half it is allowed to set for about 15 or 20 minutes without heat. The mold is then turned over and the second half is formed in a similar maner and sets for about the same length of time. The pattern is then removed and the mold gated and placed in a drying oven, where it is exposed to a heat of about 250 to 300 degrees F. for about five hours. It is claimed that by use of ashes mixed with plaster a mold is produced which is very porous as compared with molds made entirely of plaster or of plaster mixed with asbestos. Another advantage claimed is that the mold dries quicker and cools quicker, as it does not require to be heated as much. On account of the porous nature of the mold it is stated that brass may be poured into it and perfect castings obtained. The metal is poured into the mold in the same manner as in a dry sand mold and no mechanical pressure is needed.

ROLLING SHEET ZINC.

By A. L. Jackson.

The slabs of zinc received from the smelter are remelted and partly refined in a reverberatory furnace with inclined hearth of a capacity usually of about 50 tons. A metal running about 1.50 per cent of lead is obtainable; the surplus lead collects in the lower portion of the furnace and above this is found the iron and zinc alloy, "the bottoms." A small amount of iron or cadmium in the metal has no injurious influence on the rolling.

After refining the zinc is cast in molds of varying capacity according to the gauge and size of the sheets to be obtained. The molds rest on a water cooled revolving table. As soon as the slabs are set they are picked up by a boy and transferred to a travelling table or elevator moving in a closed chamber in order that the slabs may be cooled to a uniform temperature, usually 320 deg. F. At this temperature zinc has the greatest malleability.

From the cooling chamber the slabs are sent to the breaking-down or roughing rolls. From these rolls they go to the roughing shears to be cut to size, allowing for the removal of the rough edges that always form during rolling; about two or three inches must be allowed for. The cut rough sheets are slightly greased on one side and are piled to form a pack, the weight of the pack being about 400 lbs. The number of the sheets in the pack will vary with the gauge of the finished product. The pack is transferred to the finishing rolls. The number of passes varies with the gauge of the sheets to be made. The finished sheets are cut to size in the finishing shears and are then weighed and inspected. The corrugating and stamping is usually done at the rolling mills.

The roughing rolls require one roller and one boy to set the rolls on the starting side and two catchers on the opposite side. At the finishing rolls there are one roller and two boys on the starting side with two boys on the opposite side. The roughing shears require one man, while each finishing shear has two men. The remelting furnace has one man, the casting table one man and two boys.

The roughing rolls are directly connected with one 250 H. P. engine, while the finishing rolls are driven in pairs by one 150 H. P. engine through trains of gears. According to the gauge of the finished sheets one pair of roughing rolls will handle enough slabs to supply from three to five finishing rolls. The latest practice is to do away with steam engines and to drive each pair with a slow speed motor, usually of 100 Electrical H. P., the motor being built so as to stand for a few seconds a 100 per cent overload.

Owing to the high price of lead and zinc greater activity is stated to be shown in zinc and lead mining in the Cumberland, England, district, than has obtained for some years past. The old lead mines on the Pennine ranges in West Moreland are being re-opened.

A PRACTICAL COLD GALVANIZING SOLUTION.

By Chas. H. Proctor.

In the past few years there has been a good deal of controversy in regard to the relative values of the hot method of coating iron and steel surfaces with zinc as compared with the cold or electro-deposition method. Many patents have been issued by the patent office, based upon formulas composed of the common zinc salts and depending entirely upon the addition of some organic substances to play the most important part in the specifications. This was done in order to make the organic substances appear of some intrinsic value to the validity of such patents. I for one cannot realize the ground upon which such validity is claimed, as the solutions are composed entirely of commercial articles and the method is the same as applied in the production of a number of commercial electro deposits. However that may be, the owners of such patents seem to guard them with jealous care and to surround them with much mystery.

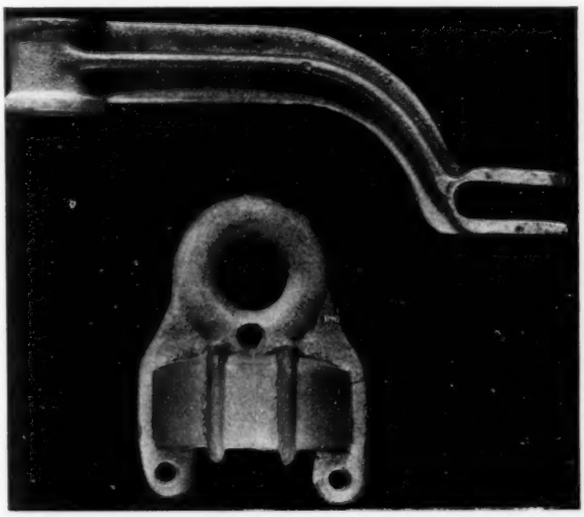
In this article the writer proposes to give a simple formula for the production of electro deposits of zinc upon iron and steel by which a good, dense, uniform deposit is obtained. As far as the relative value of the cold versus the hot or molten metal method of galvanizing is concerned, the writer leaves that matter to those interested to decide. In a short article recently published in a contemporary of The Metal Industry the superintendent of a large Connecticut manufacturing concern deprecates the value of the cold galvanizing method and bases his statement upon many practical experiments and tests which he has made. He claims that a coating obtained by cold galvanizing deteriorates in value as a protective coat in a very short time when exposed to the elements. He states that it therefore cannot be classed in the same category as a protective coating for iron and steel exposed to the elements with the coating obtained by the hot or molten method.

In some classes of articles the writer is in favor of the hot process, but for many purposes the cold process is superior. With a solution of good working quality a smooth, dense deposit is obtained which is whiter than that produced by the hot method, without the crystallized effect usually produced upon articles coated in the latter manner. Moreover many articles can be coated by the cold process to which the hot process would prove detrimental. Especially is this true of articles made of tempered or spring steel. Some years ago the writer endeavored to influence a Connecticut manufacturer to experiment with an electro-zinc deposit for coating his products. Many complaints had been received that his articles rusted rapidly, especially in the summer time. The product of the factory consisted primarily of corset and dress stay steels. As these were made of spring steel it was impossible to coat them with molten metal and have them maintain their spring temper. The writer is not in a position to ascertain whether this matter has ever been taken up, but it seems that there is a good field in this line of work for the cold galvanizing process.

Of the many formulæ proposed for the electro-deposition of zinc, those composed of the sulphate of zinc and sulphate of aluminum have been given the preference. Others consist of sulphate of zinc with the addition of sulphate and chloride of ammonia and of such organic substances as dextrine, grape sugar, benzoic acid, glucosides and like substances. In a recent patent it has even been proposed to use extract of licorice root which is claimed to exert a beneficial influence upon the deposit. Why such an addition as this should be made it would be quite hard to tell and it seems to the writer as though no more practical results can or could result from such an addition than from any of the other substances already mentioned.

In the production of deposits from sulphate of copper solutions upon other metals for ornamental purposes an addition of glycerine or gelatine has proved to be of great value in its effect upon the smoothness of the deposit. Several other electrolytic solutions are also benefitted by slight additions of organic substances. The writer, however, has always maintained that the more simple a solution could be made and give good practical results the easier it was to maintain it in continuous working condition.

From many experiments made the writer has concluded that a solution of a composition mentioned in the following gives very satisfactory results. It produces a smooth white coherent deposit without any unusual care in the methods of cleaning or manipulation other than would be exercised in the preparation of surfaces of iron unpolished for nickel plating. In fact even such usual care is not necessary. In experiments with a solution the articles have been removed from the bath many times and the deposit was always coherent and dense, without danger of separation. The formula consists of the following ingredients.



OVERHEAD TROLLEY CAR FITTINGS COATED BY THE ELECTRO GALVANIZING PROCESS.

Commercial Chloride of Zinc	8 oz.
Commercial Chloride of Ammonia	4 oz.
Commercial Hydrochloric Acid	½ oz.
Commercial Glycerine	½ oz.
Water	1 gallon

The anodes for use in connection with this bath should be equal surfaces of common antimonial lead and commercial zinc cast in sand or metal molds. By the use of the mixed anodes an equal balance of the bath is maintained without undue consumption of zinc. The solution produced is as clear as water, and the extreme cloudiness customary in zinc sulphate solutions is not perceptible. The bath is ready for use as soon as it is made up.

The method which should be followed in making up the bath consists in dissolving the zinc and ammonia salts in the water which should be slightly warm, although this is not absolutely necessary. The glycerine should be dissolved in the hydrochloric acid, then thoroughly mixed with the salts previously mentioned, after which the solution is ready for use. The distance between the anodes and the cathode should not exceed more than 4 to 6 inches. The temperature should be as near 70 degrees as possible. The voltage should be 4 to 6 volts, with an amperage slightly in excess of that which is used for nickel plating iron goods. A fairly good dense deposit may be obtained in 30 minutes, but the articles may remain in the bath for hours with a proper regulation of the current as is necessary in other electro deposits.

When the operation is complete the articles should be well washed and dried by passing them through boiling hot water which contains a little plater's compound. If necessary they should be dried out in hard wood sawdust. If a brighter lustre is desired the articles should be scratch brushed dry, using a steel machine scratch brush of sufficient fineness of wire.

As far as the method of cleaning and preparing the work for the bath is concerned, the usual hydrofluoric acid solution should be used for removing the sand. The articles should then be boiled out in a 2 or 3 per cent. solution of potash or caustic soda in order to remove the acid from the pores. This acid has a tendency to produce black spots upon the surface. The articles should then be scratch brushed or scoured in the usual manner with or without the aid of pumice stone. Water to which sal soda is added should be used in the brushing operation. The articles should be potashed in the regular manner, washed, passed through a 20 per cent. solution of hydrochloric acid, washed and immersed directly in the bath.

Small articles may be cleaned by tumbling after the pickling operations, using a 5 per cent. solution of sal soda and an iron or wooden tumbling barrel or rattler. After washing the articles may be immersed directly in the bath and will give good results without further manipulation.

The metallic contents of the bath may be maintained by dissolving sheet zinc or scrap in hydrochloric acid to saturation in the same manner as is pursued when a solution of chloride of zinc is produced for soldering. This is the cheapest method, inasmuch as a very concentrated solution of chloride of zinc may thus be added at any time, but only in small quantities. In order to increase the conductivity a small amount of ammonium chloride should be added when occasion requires it. Small amounts of acid and glycerine should be introduced when the solution does not produce a good clear white deposit.

In many baths agitation is indispensable in order to produce rapid deposits. This is especially so in cold galvanized baths, and the writer would recommend the application of some form of agitation wherever it is practical. This can be done either by the movement of the cathode rods, by a blast of air introduced in the solution, or by any other method which may suggest itself.

In a recent German exchange it is stated that a process has been brought out by the well-known firm of Siemens & Halske, of Berlin, Germany, for the electrolytic deposition of zinc from a solution of zinc sulphate. They use a very small anode with a current density of 3,000 to 7,000 amperes per square meter of anode surface. The current density used at the cathode is 150 amperes per square meter. By this method of operation the formation of spongy zinc at the cathode is claimed to be overcome.

BLACK WITH A HIGH FINISH ON COPPER.

By Wm. Voss.

The writer in this article will endeavor to explain a process for the oxidation of copper to a good black with a high finish which may not be generally known. Articles of this nature are sometimes seen in the shape of trimmings for show cases. The article which is to receive this finish should be well buffed and colored up in the same manner as for bright nickel. It is then given a copper deposit in the cyanide bath. After numerous experiments, conducted by the writer, he found this procedure the best, as the sulphate of copper bath does not seem to give the required color.

After a fair deposit is obtained the article is colored up again and is then given a flash for a few minutes in the copper cyanide bath. It is then oxidized in a bath which is composed in the following manner: A regular potassium sulphide bath is made up to which a small amount of ammonium hydrate is added and then a small amount of a solution of chloride of iron, say about ¼ as much as the quantity of ammonia used. This bath keeps for a long time. After oxidizing in the above solution the article is colored upon a soft wheel, no coloring compound being used. After this the article is marked.

The writer found that work oxidized in the sulphide bath and then dipped or brushed over with a copper sulphate solution before rinsing darkens the oxidize. The writer also tried adding a very little acid to the bath, but this precipitated the sulphur and soon spoiled the bath. The oxidizing bath is used cold.

THE NEW ANTIQUE NILE GREEN BRASS FINISH.

By Chas. H. Proctor.

A new finish which I have called antique nile green brass finish may be very easily produced and makes a very rich and antique finish. The method of procedure is as follows: The articles should be of yellow brass, sheet or cast, and the surface should be rendered smooth by the usual methods as far as cut down finish. The articles are cleaned in the usual manner and a dead or brush brass finish is applied with a tampico wheel and pumice stone, or better still, a brass wire scratch brush, using a little moist pumice stone upon the articles. This gives a more antique effect.

The articles are washed in water and immersed in a hot solution consisting of 4 ounces sulphate of copper and 4 ounces sulphate of iron to the gallon of water used. By using motion a beautiful nile green color will appear in a few seconds. The first color produced is olive green, but gradually a nile green is produced. The articles are removed, washed and the color is taken off the high lights with the scratch brush and moist pumice stone as mentioned before. The articles are then washed, dried and lacquered with a fairly good body lacquer. This finish produces a very beautiful effect and looks very antique.

For lacquering dipped brass goods that contain many perforations a lacquer made up from one part of French varnish and four parts of a mixture made up from equal parts of benzol and fusel oil may be used. This lacquer does not fill up the holes and is a very cheap one to be used for this class of work.

In silver plating antimony lead novelties, a flash in the cyanide of copper bath, a five-minute plating in the acid bath and a slight coating in the mercury dip will be found a most satisfactory method.

A MODEL PLATING ESTABLISHMENT.

By Henry L. Foote.

One of the essentials for an up-to-date plating department is plenty of space, improved machinery, abundance of light and fresh air. The National Cash Register Company at its plant in Dayton, Ohio, adopts the same general method in its plating department as it does for the development of its employees. This plating department is located on the fifth floor of one of the main buildings. This is done to give the very best light possible. All the buildings have large glass windows to give the employees good ventilation and light.

The department occupies a floor space of 360 by 60 feet. The floor is so constructed with enough fall from the center of the walls to prevent water from settling in spots. It was also deemed advisable to construct concrete floors. This floor is drained every forty feet by stand pipes to which all waste water is carried away by a system of return pipes.

There are installed eighty-four plating tanks, each of which is equipped with a separate rheostat, voltmeter and ammeter which show at all times the amount of current each tank is using and at what pressure.

VIEW OF THE FACTORY.

The amount of solution in use is 41,400 gallons, as follows:

	Gallons.
Nickel	30,000
Cyanide Copper	2,600
Acid	4,400
Silver	800
Zinc	400
Bronze	800
Oxide Plate	2,400

It is necessary for experimental purposes to maintain several hundred gallons of other solutions.

There is a center aisle running the entire length of the room and on each side of this aisle are set up the plating tanks. The tanks containing water and the scrubbing tanks, work tables, sawdust bins, etc., are all arranged along the outside walls. By this arrangement full benefit is derived from the strong light afforded by the large windows for all cleaning operations. These cleaning tanks are so arranged that the plating tanks may be easily loaded and that there will be no wasted effort.

The electrical current for plating is furnished by two 1,400 ampere Jantz & Leist, one 1,400 ampere Eddy and by a recently installed 3,000 ampere Zucker, Levitt & Loeb Co. dynamos. All of the dynamos are partitioned off from the rest of the room by glass partitions, thus protecting the dynamos from dust and moisture and increasing their life and durability.

All of the buffing, scratch-brushing and scouring tables, dynamos, etc., are driven by individual motors. In the case of the dynamos there is a constant current to the tanks and the fluctuation of voltage which is inseparable from belt driven dynamos is reduced to a minimum.

The acid dipping room is 40 feet by 20 feet and contains one elliptical dipping tank at which two gangs of men can work, and in addition one straight dipping tank at which one gang can work. The pickling tanks for the hydrofluoric, sulphuric and muriatic acid pickles are located in a smaller room set apart for that purpose.

The drying-out process is conveniently arranged in these rooms so that there is no necessity for the gang at work to take any unnecessary steps. The powerful exhaust fans carry off all the fumes arising from the acid. All steam is carried off in the same way, there being eight large wall fans required for this purpose.

The lacquer room is 40 by 60 feet and is fitted with every convenience for handling the register cabinets.

VIEW OF THE PLATING ROOM.

Glass ovens, each 10 by 20 feet, are used for baking the lacquer, and special racks are provided in which the finished cabinets are placed for inspection.

A very complete chemical laboratory is one of the features of the department in which supplies of all kinds are subjected to analysis and where experiments looking to the improvement of the different finishes are carried on.

With this plating room and its equipment it is possible to plate 275 finished cabinets per day. All parts are immersed in the solution from fifteen minutes to two hours, according to the finish desired. Counting small parts, the capacity of this plating department is a quarter of a million pieces per day.

NITRIC ACID ETCHING SOLUTION FOR SILVER DEPOSITS.

Many articles of glass or other non-metallic substances which are being used in the silver deposit industry are completely covered with silver. The design is painted out and the surplus silver is reduced by a current using a 5% solution of pure nitric acid and aluminum plates as cathodes. This procedure gives a pure metallic nitrate of silver solution which can be prepared so as to be added to the regular depositing bath. Owing to the thickness of the deposit the solutions need repairing very often. A six hour deposit can be reduced in the etching bath very rapidly.

A bright dipping acid consists of one gallon aqua-fortis, one gallon oil of vitriol, ½ gallon of water and 8 ounces of rock salt.

IMITATION ROSE GOLD FINISH FOR USE UPON THE SOFT METAL ALLOYS, IRON, ETC.

By Chas. H. Proctor.

A very good rose gold effect may be produced upon various kinds of ornamental goods such as are made from spelter lead and antimony alloys, iron, etc., with the use of very little gold upon the surface by the following method: The articles should be polished in the usual manner as for the regular plating process, although a high lustre is not necessary. A smooth surface is all that is needed. The articles should be cleaned and brass plated in a good yellow brass solution such as is mentioned in the article by the writer in the January, 1906, issue of The Metal Industry, entitled "a new copper compound for copper, bronze and brass plated ware." The arsenic may be omitted unless it is necessary and then only two or three grains to the gallon are to be used. In the article, owing to a typographical error, the formula given calls for 2 oz. and three grains of arsenic, but the amount given above is the correct one.

A fairly good deposit should be produced upon the articles and they should be afterwards scratch brushed and scoured lightly with sea sand. Better still, the articles should be passed rapidly through a slow acting bright dipping acid. This produces a better lustre for the rose gold. The articles are then gilded directly for a few seconds in a good yellow gold gilding solution. This may consist of the following ingredients:

Water	1	gallon
Phosphate of soda	8 to 10	oz.
Sulphite of soda	2	oz.
Cyanide of potassium	¼	oz.
Chloride of gold	6	dwt.

This solution should be used nearly at the boiling point. Anodes of platinum give the best results, but where large quantities of articles are to be gilded the regular 24 karat anode should be used in order to keep the gold contents of the bath at the correct figure. Any other good gilding bath may, however, be used.

After gilding, the articles are washed, dried and lacquered. The lacquer in this case should consist of part collodion and part varnish. The following formula gives excellent results:

Amyl acetate collodion, 6 oz. to the gallon	1	part
Wood alcohol French varnish.	¼	"
A thinner consisting of equal parts of benzol and fusel oil.	½	"

The articles are dried in the usual manner and afterwards the following mixture is applied to the whole of the surface with a camels' hair brush:

Finely pulverized red oxide of iron	1	part
Medium dry chrome yellow	¼	"

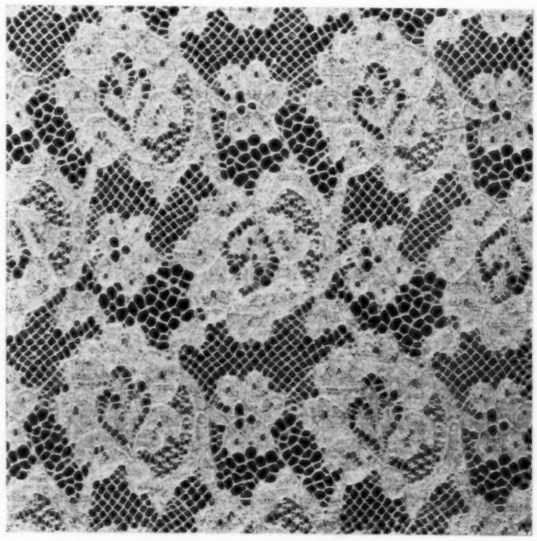
Dissolve in a mixture of one part hard oil finish of turpentine or copal varnish and three parts turpentine, using a few drops of oil of lavender in the mixture. The pigments should be mixed with a small amount of the varnish and turpentine mixture to the consistency of a thin paint. A few drops of oil of lavender should then be added.

The mixture is applied evenly to the article and the latter is dried on the lacquer heater. This coating dries very rapidly and will be sufficiently hard in a few minutes. It dries out with a beautiful dead rose gold lustre. When thoroughly cold the pigment is removed from the high lights or the parts in relief by using a little turpentine mixed with a few drops of oil of lavender, applied to a soft cotton cloth. The article is then dried again and when cold is polished lightly with canton flannel.

This method gives one of the best imitations, and when it is carried out according to instructions the finish is very adherent and the effect is equally as good as the real rose gold finish. The rose color may be varied in tone in proportion to the oxide of iron and the medium chrome yellow used.

METALLIZED LACE.

A feature of the plating industry which is attracting considerable attention at the present time is the deposition of metals on non-metallic materials, such as fabrics, wood, pottery, glass and similar goods. It is claimed by some platers that with few exceptions there are few who are able to do this sort of work and have it commercially successful. The accompanying



SILVER PLATED LACE.

cut shows an example of metallized lace which was plated by Peter Discho, of New York. Mr. Discho explains that his method is an improvement over existing processes and the specimen of lace left at The Metal Industry office is a fine sample of the plater's art. Mr. Discho is making a specialty of plating non-metallic surfaces.

PLATERS' WRINKLES.

In preparing arsenic for brightening in the brass or copper bath it is more easily dissolved in caustic soda than in cyanide of potassium. One part of soda dissolved in a small amount of water will dissolve two to three times its weight of arsenic.

The deposit from a solution which becomes low in nickel has a tendency to peel on account of the more rapid evolution of hydrogen. This is often the cause of trouble when the plater looks for other reasons. One ounce of single sulphate of nickel added to each gallon of the solution occasionally will maintain the metallic contents of the solution at efficient strength.

When a cyanide of copper bath deposits darkish brown and streaky, if the copper content is correct, ½ oz. of sodium bi-sulphite and 1 oz. sodium carbonate added to each gal. of the solution in use will increase the conductivity and produce a brighter deposit.

THE EXPIRATION OF THE HALL PATENT FOR THE MANUFACTURE OF ALUMINUM.

On April 2, 1906, the patent granted to C. N. Hall on April 2, 1889, under which the Pittsburg Reduction Company have been enabled to monopolize the production of aluminum in the United States, expired by limitation and its use is open to the general public. The patent, as is well known, covers the use of bauxite dissolved in a bath of melted cryolite, and Mr. Hall experimented for several years before he could produce aluminum satisfactorily. His patents contemplate the use of vessels which are heated from the outside, but it has not been possible to get satisfactory results on a practical scale in this manner for the production of aluminum. He therefore resorted to the use of the current not only for the electrolysis of the liquid bath, but also for the heat required to keep the bath molten. From this resulted the now celebrated suit which the Electric Smelting and Aluminum Company of Cleveland, O., brought against the Pittsburg Reduction Company, and which was finally decided in favor of the former company.

The Electric Smelting and Aluminum Company, the successor of the Cowles Brothers Co., Messrs. N. H. and E. Cowles, the well-known pioneers in the aluminum industry, and the Pittsburg Reduction Company have been in litigation for a number of years. The questions between them have been fairly fought out on their merits, through the lower courts to those of highest appeal, excepting in the case of the Hall patent which expired April 2, 1906. Under this patent the Cowles company were enjoined by an interlocutory decree from making aluminum in 1893, and then the question was thrown before a master in accounting, to determine the question of damages and profits before an appeal could be taken. This master found a claim of $294,000 against the Cowles Company. Then a motion was made, in the light of new evidence, by the attorneys of the Cowles Company, or rather the successors of that company, the Electric Smelting and Aluminum Company, to open the case on its merits. This motion was granted in the spring of 1903. Hence it left the situation as though no final decree had ever issued sustaining the Hall patent that has expired.

This first case dragged so long before the master, from 1894 to 1903, for two reasons. The Electric Smelting and Aluminum Company was afraid to push it before they settled the case regarding the Bradley patents for fear the findings would be confirmed. The Pittsburg Reduction Company were afraid to push it, undoubtedly, from a fear that the Court of Appeals would reverse Judge Taft, and leave them with no patents to stand on.

The litigation began in 1891 by a suit of the Cowles Company against the Pittsburg Reduction Company for an infringement of some of the Cowles Company's fundamental electric smelting patents, under which they were manufacturing at that time aluminum in its alloys, and selling the contained aluminum at as low as $1 a pound. This first suit never went beyond the filing of bills in the Circuit Court in Pittsburg.

In December, 1891, and February, 1892, the Bradley patents issued from the United States Patent Office. The Cowles brothers had been in interference with Bradley in the patent office, and had bought from him all of his inventions relating to electric smelting, or aluminum, that did or might interfere with their inventions. The Bradley patents that issued were based upon an old application that had been filed by Bradley in 1883. This had been hunted up by Grosvenor P. Lowrey under some form of assignment from Bradley, contingent upon any value being gotten out of such application. Lowrey pushed the application through the Patent Office, and three important patents, divisions of the same, issued. When they issued they came as a surprise upon the Cowles people. It became apparent that the suit that they were bringing against the Pittsburg company, under their own patents, could not hold in the face of the existence of the Bradley patents.

Lowrey immediately notified both the Cowles Company and the Pittsburg Reduction Company that they were infringers of these Bradley patents. This was followed by a suit between Lowrey and the Cowles Company, which lasted till 1897, wherein were involved questions of construction of the Cowles and Bradley patents, in their relations to settling the title to the Bradley patents. This case was decided in favor of the Cowles Company in the Court of Appeals in 1897.

The decision of this case untied the hands of the Cowles Company after a lapse of six years, and enabled them to assume the aggressive. Following this decision, they brought their case against the Pittsburg Reduction Company under the Bradley patents, which case was decided in the Court of Appeals for the Second Circuit, in favor of the Cowles Company, October 20, 1903. The Pittsburg Reduction Company are now licensees operating under these patents. When they took this license the case relating to the old Hall patent, which expires in April, was withdrawn from the courts. Hence it stands as though it had never been passed upon, while the Bradley patents as fundamentally covering the aluminum process have been confirmed on their merits in the court of highest appeal.

In this connection the following historical data are quite interesting: The Pittsburg Reduction Company was organized by Romaine C. Cole, a former business manager of the Cowles Electric Smelting and Aluminum Company and Alfred E. Heroult in 1888. Chas. M. Hall experimented for one year at the works of the Cowles Electric Smelting and Aluminum Company, from July, 1887, to July, 1888, using external heat around his crucibles, as described in his patents, and without success. The Cowles Syndicate Company in England, which was reorganized into the British Aluminum Company, was promoted and organized in 1887, to develop the Cowles processes.

The group of capitalists that originally erected the aluminum works at the Falls of the Rhine in Switzerland, were gotten together by the agents of the Cowles Electric Smelting and Aluminum Company in 1888 with a view to taking up the Cowles inventions on the continent of Europe; $480,000 had been offered by them to the American Cowles Company for their European rights. Mr. P. Heroult was then experimenting at the Falls of the Rhine. Grosvenor P. Lowrey, mentioned above, was at that time in Europe representing Henry Villard, the great railroad promotor. Mr. Lowrey was a shrewd and able patent attoney. His business in Europe threw him in contact with the Berlin capitalists who were in negotiation for the Cowles patent. By accident he had met Mr. Heroult and learned of Heroult's experiments at the Falls of the Rhine, and at an earlier date (1887) in Paris. Mr. Lowrey induced the Berlin group to drop their negotiations with the Cowles Company and take up Heroult in Switzerland, and hence the simultaneous development of the present aluminum process independently in Europe and America, without apparent connection.

The Commissioner of Patents, Washington, D. C., has refused letters patent to H. S. Blackmore, an inventor of a new and improved method of producing aluminum, and the case has been taken to the courts.

MAGNESIUM AS A DEOXIDIZER.

In spite of the fact that the metal industry now enjoys the benefit of many valuable special deoxidizing metals and alloys, foundrymen still are desirous of obtaining a deoxidizer that will enable them to produce really sound and perfect sand mold or metal mold castings. For instance, during the process of melting New Silver, Argentan, pure aluminum and aluminum alloys and Britannia metal, certain oxides are formed. With a view to the removal of the existing difficulties, various deoxidizers have come into the market, and while they are good for certain kinds of work, some foundrymen in the manufacture of the castings of the metals specified above say that better results can be obtained by the use of pure magnesium metal. However, it is absolutely necessary to use the very purest grade of magnesium.

For Britannia alloys, the magnesium or an alloy of magnesium-tin should be added to the molten bath shortly before pouring out. The magnesium or the alloy should be added with long handled iron pincers and must be dipped to the bottom of the crucible, continually stirring the melt. Some works add the magnesium in the form of magnesium-zinc.

In case New Silver and Argentan alloys must be deoxidized and the castings must be exceedingly tough, only pure magnesium should be used. On the contrary, should the castings be as hard as possible, but toughness is not required, a 50% magnesium-copper must be used. The addition takes place in the following manner: The weight of the magnesium preparation is pressed between two thin, flat and broad ladles and the ladles are dipped to the bottom of the crucible. The magnesium will not accomplish the desired results unless it comes into contact with all parts of the melting bath, and therefore it should be thoroughly stirred.

If tough castings are desired, the lower end of the pincers or ladles, which come into contact with the melted bath, should be made of pure nickel. If toughness is not required, plain iron pincers may be used. The addition of magnesium must be from ⅓ to 1½%; the higher the nickel contents the larger the quantity of magnesium required. The correct addition of magnesium may be determined by the fact that the cold castings should be of an even dark green shade on the outside.

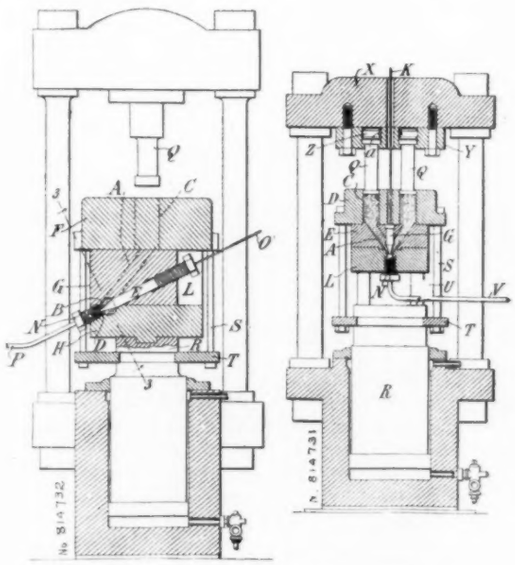
In the manufacture of aluminum bronze sand mold castings, magnesium renders valuable service, as it reacts in such deoxidizing capacity on the aluminum oxides that the latter separate themselves from the casting while the metal is being poured into the mold. In the form of 50% magnesium-copper it is also used for the deoxidization of bronze and red brass alloys. It should be added in amounts of 7 to 10 ounces to about 225 lbs. of metal.

There can be no doubt as to the value of magnesium to the metal industry, if it is properly used, for forming alloys as well as for deoxidization. The manufacture in this country of such alloys as magnesium-copper, magnesium-tin, magnesium-zinc and magnesium-aluminum is yet in its infancy.

A solder for aluminum has been invented, says Consul Atwell, of Roubaix, by Fernand Hecht, a mechanic of that city. With a soldering iron he can join together two pieces of the metal or join aluminum to copper, brass, or iron. The invention is simple, no acids or salts being used. Mr. Hecht exhibited his process satisfactorily before the professors of chemistry of the Faculty of Science, and was also awarded a medal from the Northern Industrial Society of France.

PROCESS OF EXTRUDING METAL.

The extrusion process for manufacturing metallic shapes from various metals is constantly increasing in use and on that account improvements made in apparatus for carrying it out in practice are of interest to the metal trade. In a recent patent, No. 814,731, taken out by N. A. Robertson, of New York, there is outlined an apparatus which is especially designed for extruding aluminum or other metals which require extreme pressure and generally a high temperature. The metal is introduced into the apparatus in separate streams which lead to the die chamber and which are arranged a considerable distance apart from each other in order to provide a heavy wall around the core which can resist high pressure at high temperature. Aluminum has to be extruded at a temperature when it becomes so hard as to prevent its blowing out through the die, and this requires maintaining the die and the core of the machine, where a core is used, just below a dull red heat.



MACHINERY FOR EXTRUDING METALS.

As shown in the adjoining Fig. 1 the cylinders C are formed in a block D which is separate from the block E which contains the converging passages A. A short core G is used if necessary. Where a core wire K is to be coated, the core G has a central passage as a continuation of the passage F. When hollow tubing is to be formed, the hollow core is made solid, and where a solid extruded bar is to be made the core G may be replaced by a solid plug G4. If a wire of aluminum with a steel core-wire is to be made, the steel wire is run through the core and the passages A and C of the cylinder are filled with aluminum, into which the plungers Q are forced by hydraulic pressure when the metal has become cool enough. In another patent, No. 814,732, of the same date, an apparatus is shown in cross section and reproduced in Fig. 2, in which the product emerges in a direction at an angle with the vertical. Otherwise the apparatus works in the same way.

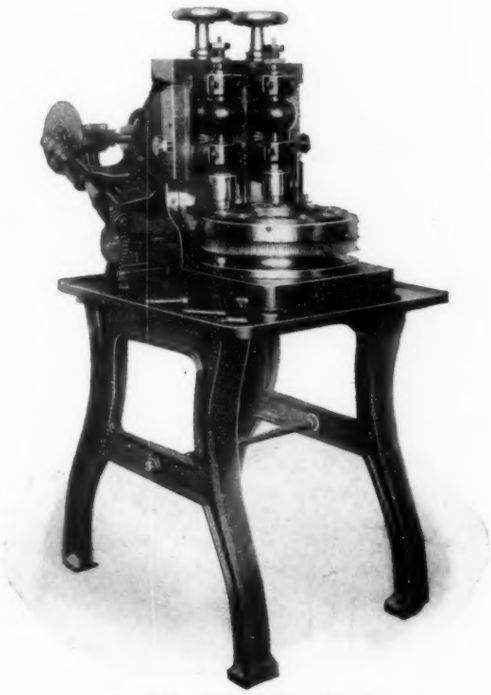
A recent British patent issued to the Siemens & Halske Company, of Berlin, Germany, covers the manufacture of pens made from tantalum metal or alloys of tantalum and other metal. Suitable alloys for this purpose consist of from 95 to 98 per cent. of tantalum and 2 to 5 per cent. of tungsten or iron.

INDUSTRIAL

NEW AND USEFUL MACHINERY, DEVICES, APPLANCES AND SUPPLIES OF INTEREST TO THE METAL TRADE.

A NEW METAL MILLING MACHINE.

How to manufacture goods and compete with the lower priced labor of the foreigner even with the aid of a tariff has ever been the problem of American manufacturers, particularly of certain classes of metal goods. To meet this competition Yankee ingenuity is constantly thinking out a machine to do the work, to replace hand labor, and one of the latest inventions in this direction is the art metal milling machine shown in the cut. It is brought out particularly for the manufacture of fine pierced jewelry work such as French piercing, and saves the operation of making and cutting the piercing tools. It accomplishes this object by milling off the back of the work instead of piercing it with the aid of dies or by cutting out by hand.



METAL MILLING MACHINE.

As seen by the illustration the machine has a revolving dial containing twelve die dishes in each of which is set a composition metal die. The dial is rotated by a worm and gear and sets on the circular V's. Over the dial are the milling cutters the feed of which is graduated to the thousandth of an inch. The work to be milled is shaped by die work that it fits to the dish die and is first held in place by a presser foot. As the dial revolves it reaches the shell chuck which is attached outside of the milling tool, which holds the work down. When the tool begins to mill the metal piece is still further held in place by a center chuck attached in the middle of the milling cutter. Another presser foot holds the work down until finished, as the circular dial continues to move.

It is seen that the operation simply consists of milling off the back of the work whether it be a brooch or a pin or other jewelry after the work has been struck up by a die at slight cost. The machine is made in two sizes, the smaller being suitable for jewelry and taking work up to 1¾ inches in diameter. A larger machine is also built for milling the handles of teapots, of hand bags, caskets and various metal trimmings. The machines are patented, built and sold by the Art Metal Milling Company, 102 Friendship street, Providence, R. I., who have been working to perfect them for a year past, and are now ready to supply the manufacturing jewelry and art metal trades.

FORMING LATHES.

By J. W. Coleman.

Special machine tools have been characteristic of the engineering development, which has marked industrial progress in the United States and among such tools those termed forming lathes, the manufacture of which may be said to have grown out of the necessities of the silverware manufacturing business, are of considerable interest, and I herewith present a few cuts of forming lathes manufactured by the Meriden Machine Tool Company, Meriden, Conn., who were the pioneers in introducing these tools.

Some thirty years ago a Meriden man astonished the manufacturers by taking orders for bottle caps, cover tips, casket handle tips and all the other various fancy shaped turned work at prices very much below what they were costing in the factories. The work not only was done much cheaper but a great deal better and was perfectly uniform. There are several who claimed to be the inventor of the machine which this man used, but it is fair to assume, however, that each of the claimants had something to do with improving and developing the machine, which in course of time became public property as far as the Meriden factories were concerned. About 1885 A. T. Booth put these machines on the market, and the firm of Williams & Booth was organized. A good trade was built up in supplying the silver plate manufacturers outside of Meriden, as the silver industry had by this time begun to spread itself over the country. But the capacity of the concern increased faster than the silver plate industry developed, and at the end of about five years the firm found that they had practically all the silver plate manufacturers supplied, and not much prospect of a further market, and Williams & Booth concluded to go into other business.

In consequence of this the Meriden Machine Tool Company was organized and bought out the business of Williams & Booth, as the present owners saw the possibility of developing the machine for other manufacturing than silver plate. There is still some demand from silver plate manufacturers, and for this the plain forming lathe shown in Figures 1 and 2 is still made and does not materially differ from the original lathe put on the market by Williams & Booth. The regular plain forming lathe shown in Figure 1 has a tail stock to support the ends of long pieces, but the bench lathe Figure 2 is without the tail stock and is designed for short work only such as bottle tops.

The Meriden Machine Tool Company made its first business to perfect the forming lathe for other work than silver plate manufacturing and the improved lathes shown

in Figures 3 and 4 are the result of their efforts, and these machines are now used by the manufacturers of valves, injectors, regulators and all steam goods made from brass or bronze, by manufacturers of plumbers' brass goods, for finishing basin cocks, handles, nuts, etc., by hardware manufacturers for finishing door knobs, etc., and by various manufacturers for finishing hearse trimmings, camera parts, gas cocks, electrical work, lubricators, hose nozzles, clock trimmings and everything that is to be finished to a certain shape or form; hence the name forming lathe. These machines are made with tail stocks as well as the plain lathes, or with turrets, as required, and have now become standard machines. The improved forming lathe has been honored with the Longstreth silver medal of the Franklin Institute of Philadelphia. It will turn a fancy or special shape in the same time that an ordinary lathe will turn a cylindrical piece of the same general size, or looking from another standpoint, will turn with unskilled labor from five to eight times as much work as a skilled man could do by old methods and will do the work better. The bench forming lathe shown by Figure 2 was designed to supply a demand for a machine at a low price that will do the lighter work, and is very useful to relieve the larger machine when crowded with work. Forming tools and chucks will interchange with any size machine.

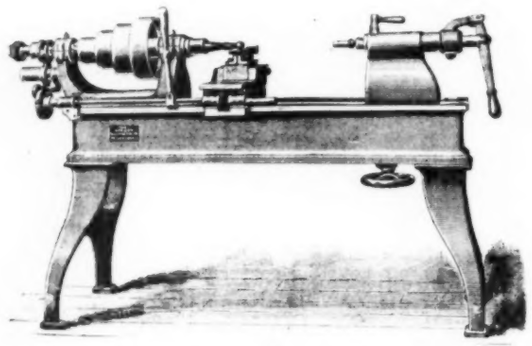


FIG. 1. PLAIN FORMING LATHE.

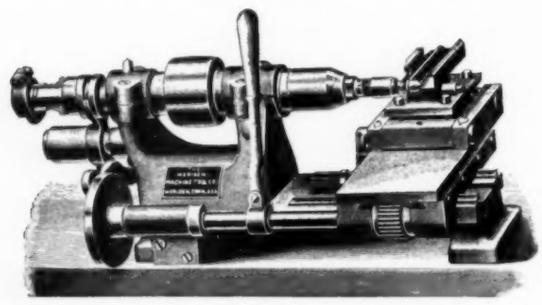


FIG. 2. BENCH FORMING LATHE.

In the machines shown in Figures 1 and 2 the turning is done with the single motion of one lever and requires no skill on the part of the operator. The first part of the motion tightens the chuck and a further movement brings the forming tool forward under the work and turns it to shape, after which the tool drops sufficiently to clear the work during the reverse motion of the lever, which motion loosens the chuck and raises the tool at the proper tiem and in position for the next piece; all operations are performed without stopping the machine. A centre may be held in the foot block for supporting long work, or a tool or drill or taps or dies for light work.

The improved lathes Figures 3 and 4 are fitted with turrets as shown; the construction of the lathes as shown in Figure 3 is the same as the one shown in Figure 4, with the exception that it has added to it the friction back gears. On light brass work the machines can be operated the same as the machines shown in cut 1 and 2, that is, the work can be chucked and turned all with one lever; on the medium size work the work is chucked with one lever and the tool drawn forward to turn the piece with another lever, both of which are directly in front of the operator and where they can be worked to the best advantage on the large work the piece is chucked with the lever and the tool operated by the large handwheel shown in cuts 3 and 4. The small handwheel shown on slides in cuts 3 and 4 is for a longitudinal adjustment of the carriage, thus giving an accurate and quick adjustment of the forming tool to make up for any variations in castings.

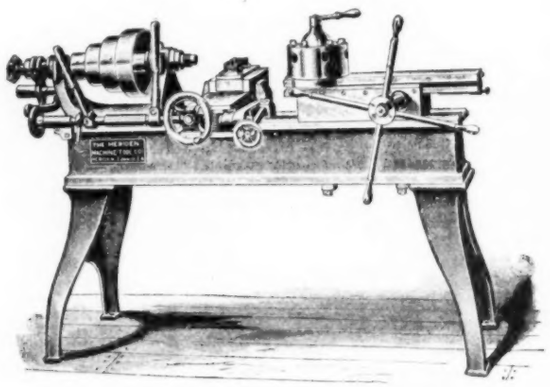


FIG. 3. IMPROVED FORMING LATHE.

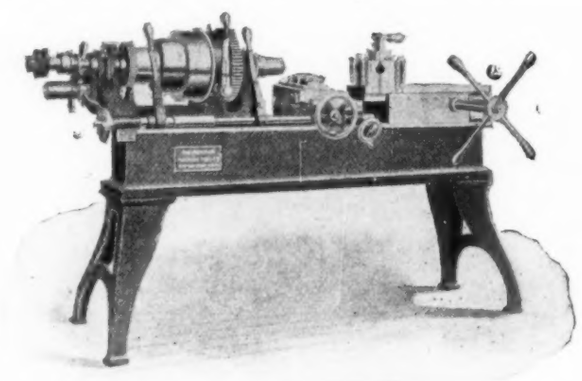


FIG. 4. IMPROVED FORMING LATHE WITH FRICTION GEARS AND TURRET (MONITOR) ATTACHMENT.

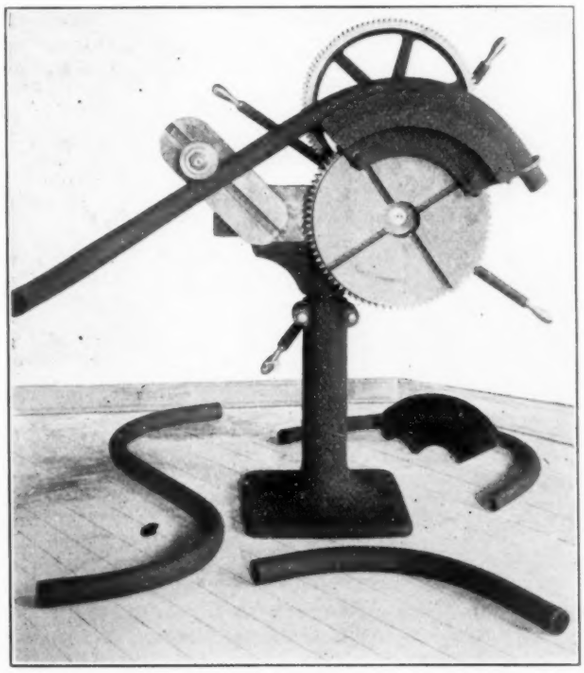
According to a recent consular report there is a bill now before the German parliament, which has for its object the creation of an export duty on potash salts. This bill is interesting to the users of potash in the United States, as Germany is the only country in the world where potash salts are found in paying quantities, and the enactment of such a law would certainly cause a rise in the price of the product.

Aluminum paper, a new article of production, is being used abroad to wrap butter. This practice is said to preserve the sweetness of the butter for a very long period.

IMPROVED PIPE-BENDING MACHINE.

The accompanying illustration shows a machine for bending pipe cold which has recently been perfected by Messrs. Pedrick and Smith, Germantown, Philadelphia, Pa. This apparatus allows the bending of piping of steel, iron, brass, copper and other material up to and including two-inch diameter. The machine can also be made adaptable for bending light angles, flats and tee bars by means of special formers. It has a powerful leverage, as the gearing is compound with a ratio of 25 to 1, and thus even two-inch pipe can be bent with little effort.

The machine is operated by a hand wheel with four handles which, by means of the compound gearing, engages the face plate to which the bending quadrants are attached. The pipe is held in the quadrant at one end by a steel plate, while the resistance stud on the movable arm engages the other end. The various curvatures are obtained by adjusting the arm, which has a swing of three-quarters of a circle, supplemented by the movement of the resistance stud in the "T" slot of the arm.



PIPE BENDING MACHINE.

The machine is mounted on a telescopic stand which can be raised or lowered to any suitable height; when the base is fastened the upper part swivels. A universal arm or section for the stand is furnished, so that the face plate may be placed in a horizontal position at any height from the floor.

Quadrants are furnished with the machine for 1-inch pipe with a radius of 6 inches, for 1¼-inch pipe with a radius of 9 inches, for 1½-inch pipe with a radius of 12 inches, and for 2-inch pipe with a radius of 14 inches. While these four quadrants are furnished with the machine, the smaller sizes of pipe can be readily bent in the larger size quadrants. In fact few workmen will take the time to change the quadrants unless they require a shorter radius than the larger quadrant will give them.

The mineral production for 1905 of British Columbia amounted to $6,150,000 of gold, $2,045,000 of silver, $5,430,000 of copper, $2,368,000 of lead, and $320,000 of zinc.

THE NEW ERA VERDE ANTIQUE SOLUTION.

By Chas. H. Proctor.

Some time ago the writer made a number of experiments with the so-called New Era Verde Antique Solution and found it to work very satisfactory. It is possible by its use to produce a durable deposit of a beautiful yellowish green color upon cast or sheet brass and bronze, and a darker green upon copper. It is not affected by oils or water. This makes it a very satisfactory solution to be used upon lamps, builders' hardware, chandelier, andiron work and other classes of artistic metal goods. It is claimed for it that it can be used on work which is heavily plated with brass and copper.

The writer has succeeded in producing very satisfactory and beautiful tones of green upon copper and brass plated iron, zinc, and the lead and antimony alloys, with a very little thicker deposit than is usually applied to these metals. The writer in his experiments used the following method of procedure: After the articles were copper or brass-plated in the usual manner they were slightly oxidized in a solution of potassium sulphide which stood about one ounce to the gallon. They were then washed and immersed in the verde antique solution for a few moments, after which they were then drained and hung in a warm place to dry. In 10 or 15 minutes the articles should be rapidly passed through boiling hot water. This procedure produces a green rust and prevents undue corrosion of the plated surface. A second immersion is then given in the verde antique solution and the articles are dried as mentioned before.

The writer has found it of advantage to moisten a painter's stippling brush of the size of a sash tool with a very little of this solution. He applies dry carbonate of copper with the fingers and then stipples over the articles. This produces a very distinct green and a beautiful verde may be obtained in a very short time in this manner.

In order to produce the old crystalline brass surface, so much in vogue with the verde effect, there is used a solution of 4 ounces of sulphate of copper and 4 ounces of sal ammoniac in one gallon of warm water. The verde solution is used and the brush is moistened with the carbonate of copper and the articles are dried as mentioned before. Slightly oxidized copper produces deeper tones of green with the high lights of dark bronze green.

In every case the articles after drying should be lacquered by dipping, using a dilute satin finish lacquer and afterwards drying them. For soft lustre upon the high lights the articles may be slightly brushed with a soft plater's hand brush. The latter should be rubbed over a cake of beeswax. For relief the articles may be rubbed in uneven places upon the high lights with a cloth moistened with a drop or two of lacquer thinner. By rubbing vigorously the copper or brass metal is shown in antique relief.

An alloy composed of 70 per cent. copper, 12.5 per cent. zinc and 17.5 per cent. nickel is stated to have a tensile strength of 26 tons per square inch and an elongation of 23 per cent. in 2 inches. The strength of the alloy containing 70 per cent. copper, 10 per cent. zinc and 20 per cent. nickel is given as 36 tons per square inch with an elongation of 14 to 17 per cent.

Invisible platinum wire is stated to have been produced by drawing the wire through the smallest possible hole which could be obtained, then coating it with silver and again drawing it through the die as many times as required. The silver was then dissolved off.

CORRESPONDENCE

IN THIS DEPARTMENT WE WILL ANSWER ANY QUESTION RELATING TO THE NON-FERROUS METALS AND ALLOYS. ADDRESS THE METAL INDUSTRY, 61 BEEKMAN STREET, NEW YORK.

METALLURGICAL.

Q.—Please furnish me with a recipe for a good cheap Britannia metal for casting purposes and also a good casting metal of lead and antimony.

A.—A cheap alloy for Britannia metal may consist of the following proportions:

Tin	45 lbs.
Zinc	45 lbs.
Lead	10 lbs.

For a white alloy the following mixture may be used:

Tin	67 lbs.
Zinc	16½ lbs.
Lead	16½ lbs.

The cheapest regular Britannia metal consists of the following proportions:

Tin	80 lbs.
Antimony	10 lbs.
Copper	9 lbs.
Lead	1 lb.

An excellent lead antimony alloy for casting purposes is made from:

Lead	84 lbs.
Antimony	15 lbs.
Tin	1 lb.

Q.—What is the best way to melt castings composed of a thin piece of brass from ½ inch to ¾ inch thick and 6 inches of cast iron, cast together? I have been using a large crucible and melting the brass off and removing the iron before it melts, but there is always sufficient iron to spoil the brass even in the last ingot I pour.

A.—After the brass has been melted down, if it is boiled up thoroughly by holding a potato under the surface with a pair of tongs, much of the iron will be oxidized and may be skimmed off. Then, if two ounces of phosphor tin are added for each one hundred pounds of brass, any iron that is uncombined will be cut and hard spots avoided. If the castings are of such a nature as to permit it, they should be placed under a skull-cracker and the cast iron broken off as well as possible before putting into the crucible.

Q.—In casting an aluminum bronze of copper 91 per cent and aluminum 9 per cent, would it be proper to melt the alloy three times and pour into ingots before melting the mixture, or to add the aluminum to the first melt? I have heard some melters claim that one should melt aluminum six times before alloying; some of them advise to remelt four times and others to just remelt copper and aluminum together once and pour them into ingots. This metal was used in an aluminum bronze pinion weighing 400 pounds.

A.—The more frequently aluminum bronze is remelted the less will be its strength and ductility and the more difficult it is to get a casting free from oxide and dross. Its use is not to be recommended, as in nearly all instances manganese bronze ingot could be used more satisfactorily and with less trouble to the brass founder. If it is absolutely necessary to have the aluminum bronze, the copper should be of the best quality and melted very hot, and kept well covered with lime and fluor-spar, especially if the melting is done in a Schwartz or other oil melting furnace. The aluminum should be put to the bottom of the molten copper with a pair of tongs and the mixture should be well stirred with a graphite stirring bar. If the metal is well alloyed it need not be remelted but may be poured direct. One remelting will do little harm, provided the metal is thoroughly well covered. Just before pouring add two ounces of silicon-copper for each one hundred pounds of metal and stir in thoroughly.

Q.—We use a Schwartz melting furnace and the first time I used an iron ladle lined, my sprues expanded and the castings were porous; the metal boiled a little as the lining was not quite dry enough. Do you think that is what caused it?

A.—When hand ladles are used they should be heated red hot over an oil ladle heater or by holding them over the spout of the Schwartz furnace. Boiling metal is more likely to produce misrun castings than to make them porous. It is quite probable that you had too much air on your Schwartz furnace or blowed the metal too long and that this was the cause of the porous castings. The quicker you melt in the Schwartz, the better it is and the metal should be well covered with lime and fluor-spar.

PLATING AND FINISHING.

Q.—Please give me some information how to make a battery strong enough to run a silver solution of 4 to 6 gallons.

A.—The Bunsen element is the most suitable one for a silver solution of 4 to 6 gallons. It may be constructed in the following manner: A gallon glass jar such as is used for gravity batteries or any other similar jar may be used as the outer vessel. In this vessel is placed a cylinder of thick sheet zinc, into which is placed a porous cell. The other electrode is made of gas carbon and stands in the porous cell. A strip of copper is soldered to the zinc cylinder and a binding or connecting screw is attached to this copper strip. A brass or copper clamp secured with binding screws and having a connecting screw at the top should be fastened to the carbon plate. Copper wires lead from the binding screws on the zinc and the carbon electrodes to the bath. The outer vessel is filled with a dilute sulphuric acid solution made up from one part by weight of acid and 15 parts of water. The porous cell is filled with concentrated nitric acid, care being taken that both fluids are standing at the same level. The zinc is the positive pole and should be connected to the anode, while the carbon is the negative pole and is connected to the cathode.

Q. We are bothered very much by buffing dust accumulating upon our exhaust fans in such a way that it throws the blower out of balance. Could you advise us as to the best way to overcome this and the best way to handle this material in such a way as to avoid trouble?

A. Buffing dust, if at all fibrous, tends to cling to exposed edges on the wheel. The difficulty can be overcome by using a special form of wheel without side plates. This is generally in the form of a cast iron cone with blades cast thereon, the angle of the blades being such as to present no edge upon which fibrous material can cling.

Q.—Will you kindly give me a formula for producing chocolate color on brass.

A.—A chocolate color can be produced on brass articles by immersing them in a slightly warm solution of sulphate of copper. The solution is made by dissolving 16 ounces of the commercial copper salt to each gallon of water used. This solution produces a dark olive green color. The articles are washed and immersed for a second in a warm solution which contains ⅛ to ¼ ounce of sulphuret of potash and a few drops of ammonia to each gallon of water used. The articles may be relieved by the usual methods employed for obtaining an antique effect or they might be slightly scratchbrushed to give lustre to the color. The articles should be lacquered with a heavy body lacquer.

Q.—Please let me know how bright silver paint is made for silver deposit work as mentioned in the March, 1905, issue of THE METAL INDUSTRY.

A.—Sulphur is dissolved in oil of spike or lavender to a syrupy consistency. Chloride of silver is dissolved in ether and the two solutions are mixed with the application of a gentle heat. The solution thus obtained is evaporated until it gets to the thickness of ordinary paint. In this condition it is applied with a fine camel's or sable hair brush to such portions of the articles as it is desired to cover. The objects are fired in the usual manner. This operation reduces the sulphide of silver to metallic silver. The articles are lightly brushed, cleaned and immersed in the silver bath, in the manner usual for this class of work.

Q.—I have used hydrochloric acid for pickling cast iron before nickel plating and for a long time the results were most satisfactory, but then suddenly the work began to behave badly in the bath. The ground work would remain black in spite of everything and finally the polished surfaces refused to plate except in streaks. Lime was used to neutralize the acid after pickling and soda was tried with the same results. The nickel solution worked all right on unpickled work. What is your opinion of the trouble?

A.—After careful consideration we are of the opinion that the trouble is due to the acidity of the bath. Unless a boiling alkaline solution, or nearly so, is used to neutralize the effect of the hydrofluoric acid pickle which is contained in the pores of the castings, the effects noted in the inquiry would probably be produced. It is stated that unpickled castings plate correctly. This goes to show that the bath must be nearly correct and that the trouble arises from the unneutralized acid contained in the pore of the metal of the pickled castings. It would be advisable to use a boiling solution for the castings, consisting of one oz. of 26 per cent. ammonia water to each gallon of water used. The articles should be immersed for at least 15 minutes into this solution at a boiling temperature and they should be washed well in boiling water afterwards. They should be kept immersed in sal soda water until they are ready for the plating operation. When continually plating iron in nickel solution it is advisable to add occasionally a small amount of free ammonia. Four oz. to a hundred gallon solution will be sufficient. This neutralizes the free acid which forms in the solution and produces ammonium sulphate, which latter adds to the conductivity of the bath.

Q.—We should like to have a formula for a nice rose finish for jewelry novelties on brass not burnished but shaded, and also a light green finish for the same purpose. The finish given in the December, 1905, issue of THE METAL INDUSTRY is too cheap.

A.—A solution for a rose gold finish for jewelry novelties should consist of the following ingredients:

Chloride of gold	8	dwt.
Carbonate of copper	½	oz.
C. P. cyanide of potassium	6	oz.
Water	1	gal.

The solution should be prepared in the same manner as a regular gilding solution. When the copper is added the solution should be kept at not less than 150 degrees and several trials should be made before all of the copper is added. Platinum or gold anodes may be used and a 10-kt. anode gives good results. The above solution may be diluted down to 2 gallons if it is maintained at a nearly boiling temperature, but the current is the best regulator for a bath, let it be composed as it may. An antique green gold solution should consist of the following ingredients:

Chloride of gold	4¾	dwt.
Chloride of silver	1¼	dwt.
Cyanide of potassium	2	oz.
Water	1	gal.

A platinum anode works best with this solution. The temperature of the solution should be 160 degrees F.

Q.—Can you advise us of a solution of nickel cyanide which will enable us to plate valves of musical instruments so that they could stand the "grinding-in" process without the nickel chipping off.

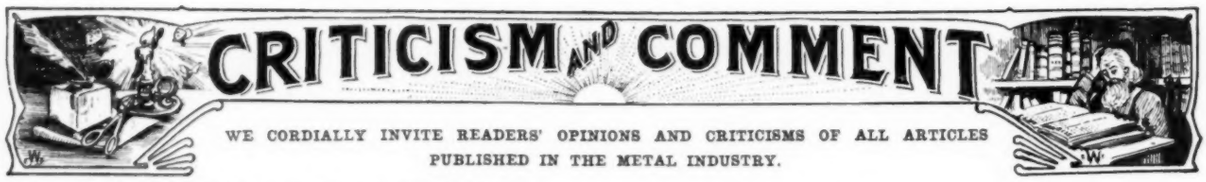
A.—We are not aware of any successful cyanide of nickel solution in use. You might try the following formula:

Sulphate of nickel	8 oz.
Carbonate of soda	8 oz.
Cyanide of potassium	5 to 6 oz.
Ammonia water	1 oz.
Water	1 gallon.

Dissolve the sulphate of nickel in as little hot water as is necessary for solution. Dissolve the soda in the same manner. Add the soda solution carefully. When the nickel is precipitated as carbonate, wash well several times and then dissolve in the cyanide of potassium, adding the ammonia last. Cast or rolled anodes may be used but they should be as soft as possible. It may be necessary to make a more concentrated solution than that mentioned above, but this can soon be ascertained with a little experimenting.

Q.—We should like to know a process for etching 6, 8, 10 and 14 kt. gold. We also have a dynamo available if such has to be used in the process.

A.—The electro-etching process would probably answer best for your purpose. The method of procedure is as follows: Make a mixture consisting of one part of hydrochloric acid and three parts of nitric acid, commercially pure. Of this mixture take 5 parts or more, if found necessary, and 95 parts of water. A small tank should be rigged up, on the principle of a plating tank. It should be lined with lead or asphaltum. However, an acid crock will answer the purpose. The articles to be etched should be connected with the positive or anode pole. The cathode or the negative pole should consist of carbon or of sheets of pure lead. If a lead-lined tank is used, that is to say, one which is prepared by lead burning of the seams and, if the lead is pure, the lining may be connected so that it acts as the negative pole. In either case the articles should be completely surrounded and the distance between the articles or anodes and the carbon or lead cathode should not exceed two inches. A strong current should be used. The articles to be etched should be prepared in the usual manner with a non-conductive material. Air-drying japan thinned with benzol answers the purpose very well and the parts to be etched should be left uncovered as is usual in such cases.



WE CORDIALLY INVITE READERS' OPINIONS AND CRITICISMS OF ALL ARTICLES PUBLISHED IN THE METAL INDUSTRY.

CHEAP INFORMATION A COSTLY INVESTMENT.

To the Editor of THE METAL INDUSTRY:

Like the old adage that the nearest way through is not always the shortest way home, so cheap information is sometimes a dear investment. Recently there called upon the writer for advice a plater who was suffering from the consequences of ill-applied information. His nickel solution did not produce as white a nickel as he desired and he thought he would try to improve its color. As he was not sure what to do to remedy the defect, he consulted a friend who is an experienced polisher in a large concern well-known for the production of a high grade of nickel plated articles. This friend imparted the information that in the factory where he was employed the plater uses sulphuric acid to make his solution deposit white.

Acting upon this information, the plater commenced to add sulphuric acid to his bath, of course, in unknown quantities. Many platers will recognize the result, which was, of course, no deposit and only a very copious evolution of hydrogen. This addition of acid continued until one gallon had been added to 200 gallons of solution. Realizing at last that too much acid had been added, he resorted to the usual neutralizer employed for such purposes, namely, ammonia water. Not knowing the amount of ammonia necessary to neutralize the acid, he added what he thought a sufficient quantity by testing the solution with litmus paper. It happened that the neutralization was very near the desired results. The results, however, obtained on the articles to be plated were very unsatisfactory. The deposit was not adherent, it peeled off in the solution and the color was any old thing from a dirty black nickel to a variegated antique brass effect.

He did not know what to do now when a friend showed him an article in a publication concerning the use of boracic acid for the production of very white deposits of nickel. Thinking that it was not possible to make the solution any worse he added 5 or 6 pounds of boracic acid. The results as far as the deposits were concerned were not better and perhaps worse. Finally he gave up in despair after spending several days to get results.

Of course any plater with any extended knowledge of the business will weigh information carefully before making use of it, especially in making additions to plating solutions. When the writer was called upon for advice he was fully aware that the solution under consideration in its present condition was of no avail. The amount of free ammonia sulphate formed in it by the saturation of the acids with the alkali and the probable formation of borate of ammonia had to be considered and to remove these defects was more than possible to accomplish.

The writer advised the inquirer to add at least 30 pounds of common salt and, if this was not successful in recovering the action of the bath, to throw the latter away and to make a new one. The plater promised to report the next day, and when he returned he stated that the solution was rapidly recovering its action and producing a good white deposit. The solution, however, plated very freely, which was something that he had not been accustomed to, for the reason that nothing but the single sulphate of nickel had been added to the bath and the conductivity had to take care of itself.

Many times when called upon to remedy the defects of nickel solutions, especially when they have refused to give a white deposit, thus showing that the conductivity was very defective, I have added 2 or 3 ounces of common salt to each gallon of solution. This would rapidly improve the solution and would produce a beautiful white deposit when the metallic content was correct.

As a matter of advice to the uninformed I would say that I have always used sulphuric acid in acidifying nickel baths or to increase the brightness and whiteness of the deposit, although boracic acid is highly recommended. I have obtained better results without it, unless, when first preparing a new nickel solution. Then it has given good satisfaction when used in the proportion of 1¼ to 1½ ounces to each gallon of solution. This is especially the case when the following formula is used in connection with it:

Single sulphate of nickel	5½ oz.
Ammonium chloride	3½ oz.
Water	1 gallon

In making additions of sulphuric acid not more than five ounces of free acid should be added to a 200 gallon solution. If this amount is added every week, excellent results will be obtained when the bath is working constantly. It is also well to remember, if at any time an accidental excess of acid is introduced into the bath, that three ounces of 26 per cent. ammonia water will neutralize one ounce of 66 per cent. sulphuric acid. It is thus possible to produce neutrality very quickly when occasion requires it. CHAS. H. PROCTOR.

A NEW FINISH (KERMESS FINISH).

To the Editor of THE METAL INDUSTRY:

The following is a formula for a new finish which is called kermess finish. Take a pint of common nitric acid and dissolve in it sulphate of copper until complete saturation has been obtained. Dissolve one oz. of this mixture in one gallon of water. This procedure will produce a greenish opaque solution. Now add enough muriatic acid C. P. to clear it up, and then add one oz. of pulverized blood stone. This solution should be used near the boiling point. It produces a beautiful finish on copper or copper plated goods, which is better than bronze medaille.

AN OCCASIONAL CORRESPONDENT.

For cheap deposits of silver on brass goods the articles should always be coated with a five-minute deposit of nickel, flashed in a warm silver strike solution and plated for 5 or 10 minutes in the regular bath. Such deposits should be colored on slow running canton flannel buffs. When this work has been well done, it looks equal to the burnished article with heavy deposits.

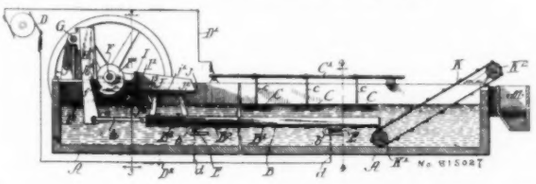
The addition of a small quantity of arsenious acid is claimed to make the brass bath brighter, but care has to be taken that not too much is added, as it will spoil the color of the deposit.

PATENTS

REVIEW OF CURRENT PATENTS OF INTEREST TO THE READERS OF THE METAL INDUSTRY.

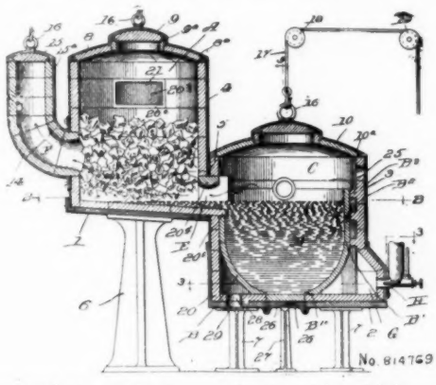
814,007. March 6, 1906. Mold Compound. Max Ams, Mt. Vernon, N. Y.—The mold is intended for casting metal and consists of a mixture of 1 part powdered mineral wool, 1½ parts plaster of paris, ½ agaragar and 1 part of water. The mold is made by surrounding a model with the above composition and permitting the latter to set. It is then cut into sections so that it may be drawn off the model. The agaragar renders the mold plastic, so that it can be drawn off from undercut portions of the model. The mineral wool has the purpose of increasing the flexibility of the mold and to give its surface an increased degree of smoothness.

815,027. March 13, 1906. Electroplating Apparatus. Guy L. Meaker, Chicago, Ill.—The apparatus is especially designed for plating small articles with metals, such as nickel and zinc. It consists of tank A within which there is a tray B, which serves as support for the article to be electroplated. Its supporting surface B is made of metal wire netting. The tray is connected with the cathode and above it are arranged a series of anodes CCC. The trap is so arranged that it can be given a horizontal reciprocating movement by means of cams and springs.



The latter cause the tray to be suddenly thrown back by which means the articles on the tray receive a continuous reciprocating movement. A feed receptacle J is attached to the tray and partakes of its jarring motion, so that articles placed on its bottom will be constantly shifted toward its forward end, where they fall upon the tray. The articles are discharged from the rear end of the tray B and are removed by an endless traveling conveyor belt K. Means are also provided to turn the articles over while they are being plated.

814,769. March 13, 1906. Cupola. F. N. Cline, Chicago, Ill.—The cupola comprises two chambers, A and C, in the first of which the metal is melted and from which it flows through a trough E into a crucible B mounted in the second chamber C. It

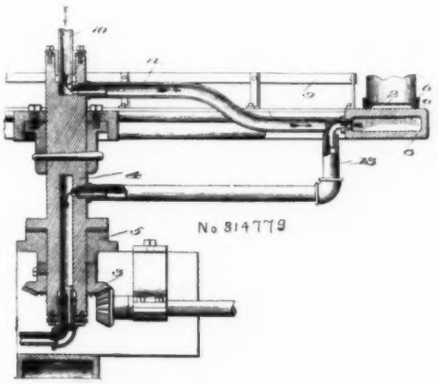


is here exposed to a more intense heat and is withdrawn for casting through the spout D. The metal to be melted is deposited in the melting chamber A. The apparatus is heated by flame furnished from oil burners or vapor burners.

812,979. February 20, 1906. Molding Machine. A. Choiniere, Holyoke, Mass. The molding machine is provided with means for raising the flask bodily from the table in order to turn it over and to bring the base board on the top. It also has means for lifting either of the flask-closing boards from the flask in order to permit the removal of the pattern from the mold. The mechanism is described in detail.

812,494. February 13, 1906. Soldering Compound. A. R. Hussey, Chicago, Ill. In making the compound, which is to be used as soft solder, lead and tin in equal parts or up to a proportion of three to one, according to the use to be made of the solder, are ground together. A convenient mixture consists of 1 part lead, 1 part tin, ⅛ part beeswax, and ⅛ part chlorid of zinc by measure. There may be added ⅛ part of rosin. When chlorid of zinc is used as a flux it should be first mixed with the wax or fat and should not be mixed directly with the metal. The flame of a lighted match is stated to be sufficient to cause this solder compound to become fused.

814,779. March 13, 1906. Method of Soldering. C. W. Graham, Rome, N. Y., assignor to the Utica Industrial Company of Rome, N. Y.—The invention relates to a method for setting the solder at the joints of tin cans and similar articles. It comprises



a rotary turn table to which the cans are fed with the solder in a liquid or a semi-liquid condition at the joint between the body 1 and the head 2 of the can. The table has a hollow annular ring or ledge 6, upon which the cans are placed and carried around. An inlet pipe 10 for cold water communicates with the connecting pipe 11 and cools the soldered can.

812,004. February 6, 1906. Molding Machine. P. Bonvillian, Paris, France. The machine is intended for molding long parts "even," without any taper, such as, for instance, ordinary carriage axle boxes, shells, etc. It consists of a fixed table adapted to hold one or more similar patterns, a stripping plate for surrounding the patterns and vertical rods fixed to the stripping plate and passed through the fixed table. A plate connects the lower extremities of the vertical rods. A piston which moves in a cylinder which is rigidly connected with the fixed table has its upper extremity connected to the plate. A frame surrounds the patterns and rests upon a stripping plate. The machine is provided with a rammer which compresses the sand around the patterns as well as in the interior and outside.

813,614. Feb. 27, 1906. Mold Charging Apparatus. P. Bonvillain, Paris, France. The apparatus is intended to be used with molding machines in order to supply them quickly with the exact quantity of sand required for each molding operation without any hand labor. The apparatus consists essentially of a hopper under which a movable box is brought which automatically receives a certain supply of sand. By the movement of a lever this box is then brought over the mold and the sand contained in it is automatically distributed into the flask of the molding machine. By another movement of the handle the box is returned under the hopper and refilled, and is then ready again to fill another flask. The apparatus is provided with stop-off devices by which the amount of sand to be delivered into the molds can be regulated as desired.

TRADE NEWS

TRADE NEWS OF INTEREST DESIRED FROM ALL OF OUR READERS. ADDRESS THE METAL INDUSTRY, 61 BEEKMAN STREET, NEW YORK.

The United States court has appointed Wm. H. Marlatt receiver for the Gobeille Pattern Company, Cleveland, O.

The new power plant of the Randolph and Clowes Rolling Mill, Waterbury, Conn., is complete and is in operation.

A new novelty works for Taunton is the plant of Dunbar & Hayes, who will manufacture a varied line of metal goods.

W. H. Russel will open a new brass foundry in Spartanburg, S. C., about May 1, and is in the market for some equipment.

B. H. Moore has purchased the machinery and effects of the Penn Brass Company, 621 Commerce Street, Philadelphia, Pa.

The Scovill Manufactuing Company of Waterbury, Conn., have just finished a five-story concrete building, which will be used as a cutting-up shop.

The Waterbury Clock Company, Waterbury, Conn., have begun to build a five-story brick building, 136x43 feet, which will be used for general work.

The Nikolas lacquers are claimed to be standard in the West and are sold in New York and vicinity by the company's agent at 85 Centre Street, New York.

The H. W. Ellis Brass Foundry of Taunton, Mass., has taken additional room and will engage more molders. Mr. Ellis makes a specialty of fine metal castings.

The Evans Stamping and Plating Company of Taunton, Mass., are planning to enlarge their thermometer department. They manufacture a line of oven thermometers.

The Ohio Metal Refining Company, Norwalk, O., are considering the removal of their plant to Toledo, O., where a platinum refinery will be a feature of the equipment.

Richards & Company, Boston, Mass., report that their business so far this year is twenty-five per cent ahead of 1905. They have not as yet felt any ill effects of the high metal prices.

Stanley Doggett, 101 Beekman street, New York, is marketing the "Peerless" Parting Compound, which is claimed to produce perfect castings with all kinds of intricate patterns.

San Giacomo Sons, metal dealers, at 9-11 Abel street, Newark, N. J., are buying and selling all kinds of old metals, and they solicit the inquiry of any firms who have such scrap to sell.

"Spot cash, any quantity," for skimmings, buffings and metal waste, is ever the slogan of John C. Culbert, of Pawtucket, R. I. No quantity is too large for Mr. Culbert, none too small.

It has been reported that one of the best jewelry buildings in Providence, R. I., will be occupied by the G. W. Parks Company, silversmiths. The building is 200 by 60 feet, four stories high.

The Providence Silver Plate Company, Providence, R. I., has been started by Robert F. Carroll & Son to manufacture casket hardware and to carry on a jobbing business in electro-plating.

The Baird Machine Company, Oakville, Conn., are building a line of tumbling barrels which have many unique and valuable mechanical features. Their catalogues fully explain these features.

The Kennedy Valve Manufacturing Company's representative, Mr. T. C. Flinn, desires catalogues of machinery and brass and iron foundry equipment to be sent to him in care of the Board of Trade, Elmira, N. Y.

The Waterbury Farrel Foundry & Machine Company, Waterbury, Conn., report that since the first of July, 1905, they have had the best business in their experience, which experience dates back for more than fifty years.

There has recently been organized in Muskegon, Mich., the Central Foundry Company, which will manufacture machinery, castings in brass and iron, and babbitt and white metal. John Richardson is one of those interested.

C. W. Leavitt & Company, 15 Cortlandt street, New York, are successfully advocating the use of Magnesium metal as a deoxidizing agent, and they are in a position to supply some valuable data on this subject to those interested. They will remove their offices this month to 220 Broadway.

Bruce & Cook, 190 Water Street, New York, carry a full line of the non-ferrous and ferrous metals, including pig lead, pig tin, spelter, antimony, copper, solders, babbitt, tin plates, sheet iron, etc., and solicit the inquiries of foundrymen and other users of metals.

The Mitchell & Van Meter Company have started a new brass foundry at Pottstown, Pa., with a force of over fifty men. The superintendent of the new plant is J. J. Ward, formerly with the McShane Brass Foundry and Manufacturing Company, Baltimore, Md.

The Zucker & Levett & Loeb Company, 526 West 25th street, New York, manufacturers and dealers in platers' supplies, have begun to add another story to their present building of 150 x 35 feet. The increased floor space will be used by their dynamo department.

The International Silver Company of Meriden, Conn., which operates a small brass foundry employing three molders, will double their force and capacity. E. P. Golden, superintendent of the hollow ware department, is supervising the enlargement of the foundry.

The Owen C. Hassler Company, Chicago, Ill., are making the "Albright" polishing and cleaning paste, which can be used as a metal polish, a hand soap, and in a variety of other ways. This polish contains no acid, lye, nor grit, and is especially adapted for the platers' uses.

C. C. Cowles & Company, New Haven, Conn., manufacturers of carriage hardware and auto trimmings, have leased the brass foundry of that city formerly run by J. Reynolds, which they will use for making their own castings. J. Berry, formerly of Newark, is foreman.

Business is increasing to such an extent with the Imperial Castings Rooms, of Providence, R. I., that they are looking for larger quarters. The rooms make art metal castings in ashes and plaster molds, the process for which is described in this number of THE METAL INDUSTRY.

C. M. Dally, 29 Broadway, New York, agent for the Bates & Peard annealing furnace, has recently closed a contract to install these furnaces at the works of the American Steel & Wire Company, Worcester, Mass., and negotiations are under way with several prominent jewelers and silversmiths.

The foundry at Attleboro, Mass., established by the late A. T. Salt, is now in operation as the Atlas Silver Foundry Company, with Geo. C. Belcher, manager, and A. I. Britton, foreman. The complete organization of the company will soon be finished. The foundry produces silver and art metal castings.

M. Keeley has sold out his interest in the Waterbury Scrap Iron Company of Waterbury, Conn., to his son, M. E. Keeley. Their old quarters have been torn down on account of railroad extensions and they have put up a new building not far from their old plant. The company report a brisk business.

The Empire Brass Foundry, Binghamton, N. Y., has been moved to 81-83 Water street, where a much larger floor space is available. Additional furnaces have been installed and there is now every facility for turning out all kinds of brass, bronze and aluminum castings on local and out-of-town orders.

The Materne Manufacturing Company, St. Louis, Mo., are making a line of copper-lined iron pipe in sizes from 1 inch to 6 inches. This pipe is especially adapted for use where ordinary iron pipe would be corroded. Franklin Williams, 39 Cortlandt Street, New York, is the New York representative.

A rather peculiar coincidence presents itself in our advertising pages in the adjacent advertisements of the metal houses of Richards & Company, Boston, Mass., and Bruce & Cook, New York, both of which were established in the same year and which now have nearly a century-old record behind them.

The old factory used by Geo. G. Prentice & Company of New Haven, Conn., for the manufacture of lathes, has been leased to the Mayo Radiator Company, who make automobile specialties. Geo. G. Prentice & Company now have a new and finely equipped factory, already described in THE METAL INDUSTRY.

The S. Obermayer Company, preparatory to remodelling their Cincinnati offices, have taken temporary quarters in the Union Trust Company Building. Extensive improvements will be made, as the company have felt for some time that the capacity of their general offices was inadequate to meet the rapidly growing business.

The Ajax Metal Company, Philadelphia, Pa., will erect new buildings to cost $40,000, the equipment of which will include 3 horizontal Coatesville boilers and a 300 horse-power Green engine, direct connected with alternating current generator. Plans are also being prepared for the extension of the foundry, shipping room and stock room.

Reed & Barton, Taunton, Mass., the well-known silversmiths, have broken ground for a new brick casting shop, 120x140; the shop will be equipped with surface tracks for carrying molds, and with an oil furnace manufactured by the National Supply Company of Chicago, Ill. Reed & Barton have just finished an addition to their plating plant.

The Phillips Insulated Wire Company, of Pawtucket, R. I., who have been in business for twenty years, have recently installed a new copper and rod wire mill and have put it in operation. The present capital stock of this company is $1,000,000 and the officers are: H. F. Bassett, president; H. O. Phillips, treasurer, and E. B. Phillips, secretary.

The Stiles-Morse Company, Chicago, Ill., have removed their offices to Rooms 201-202, Western Union Building. This company represents the E. W. Bliss Company, Brooklyn, N. Y., power presses; the Fisher Foundry & Machine Company, Pittsburg, Pa., heavy rolling mill machinery, and the Franklin Moore Company, Winsted, Conn., chain hoists.

Philip Bromfield & Company, metal dealers, Boston, Mass., will move on May 1 to Midway Street, South Boston, where they will have a three-story brick building, 150x100, and a yard for storing their scrap iron. In their new location they will be situated near the New York, New Haven and Hartford Railroad, and they will also have a fine warehouse and smelting plant.

J. W. Beach, a metal dealer of Bridgeport, Conn., has just put in a Monarch crusher, and his three-story plant, which is located alongside the New York, New Haven and Hartford Railroad, is now equipped with electric separator, alligator shears and elevator, giving him thoroughly up-to-date apparatus for the handling and recovery of metals. The plant is in charge of R. D. Cate.

The foundry, platers' and polishers' supply house of Cutter, Wood & Stevens Company have taken another floor in their building at 68 and 70 Pearl Street, Boston, Mass., giving them three entire floors of the building, which extends from street to street. The company sell everything in the line of foundry, finishers,' platers' and polishers' supplies, and have ready for distribution a new machinery catalogue.

C. W. Moore, metal dealer, of Bridgeport, Conn., has bought a new Monarch furnace and will shortly operate that and also an Orbison furnace, which will give him a good opportunity to study the relative merits of furnaces and oil as a fuel for the melting of scrap metals. Though Mr. Moore moved into larger quarters within a year, he has already outgrown his present plant. Business has been very good with him for some time.

Among the foreign trade opportunities presented in the *Daily Consular and Trade Reports* are No. 43, Japanese merchant wishes to place orders in America for a variety of raw and manufactured metals, including galvanized iron wire, tin plate, pig lead, etc.; No. 48, leading Japanese wholesaler soon to visit the United States is prepared to buy watch movements and cases, spectacle frames, all kinds of high-grade and cheap jewelry, etc.

The new Bannatyne Watch Company are established at 32 Canal Street, Waterbury, Conn., where they will shortly begin the manufacture of watches. Mr. Bannatyne, from whom the company takes its name, was the master mechanic with the Waterbury Clock Company for a number of years, and is the inventor of the Ingersoll dollar watch. The members of the company are: Franklin Farrel, Jr., president; George C. Bryant, treasurer; Archibald Bannatyne, secretary and treasurer.

Finding their present quarters inadequate the New Jersey Aluminum Company will erect a four-story steel and brick factory building, 90x50 feet. The first floor is to be used for storage and for handling the raw material, the second for cutting and press work, the third for spinning, and the fourth for printing, lithographing and pattern making. The company finds so great a demand for aluminum castings for automobile and autoboat construction that they have been forced to double the capacity of their foundry and even now have to do overtime work in order to catch up with orders for the spring trade.

Fifteen hundred core ovens in use all over the world in the largest foundries to the smallest is the record to date of the Millett Core Oven Company of Brightwood, Mass. The company build both a stationary and portable oven with hinged shelves and other features which are not obtainable in any other foundry oven, and issue a nicely illustrated and printed catalogue which gives a complete description of them. Among their patrons are the Westinghouse Electric and Manufacturing Company, General Electric Company, American Locomotive Company and the International Steam Pump Company, and a host of other manufacturers who operate foundries.

Owing to the constantly increasing sales of their "Triumph" Water Lift, the Ohio Pump and Brass Company, Columbus, O., have been forced to increase their facilities for manufacture.

On May 1 the Taunton Crucible Company of Taunton, Mass., will move into their new factory, which is built in front of one of their present plants. The new building is a frame structure,

95x100, substantially built and with a nice office with bay windows. The old factory in the rear occupies a space of 85x100, and has one of the largest and oldest crucible firing kilns in use to-day. Joseph Dixon worked among these kilns before he started in the crucible business in Jersey City. With their new factory and additional equipment, the Taunton Company will be in better shape than ever to take care of their customers. One of their specialties is retorts for smelting and refining works.

The Atlas Machine Company has been organized at Waterbury, Conn., by A. W. Limont, A. Callan and Andrew Gardner. The company will be incorporated under the laws of the State of Connecticut and will make sheet metal and wire making machinery. They have bought half of the shop equipment of Cross & Spiers, 37 Canal Street, Waterbury, and leased a part of their shop room. All three of the incorporators are practical men. Mr. Limont has been with the Holmes, Booth & Haydens Company for 23 years as master mechanic, and in other positions. Mr. Callan was with the Waterbury Machine Company, having been foreman of their automatic department, and Mr. Gardner was foreman of the heavy machinery department of the Waterbury Farrel Foundry.

By direction of, and under an appropriation of Congress the United States Geological Survey Department is now making exhaustive and interesting experiments in the extraction of the various minerals found in the black sands and placer mines of the Pacific Coast to determine which ones are of economic value. Iron ore of exceptional purity will probably be one of the important values and it is hoped that platinum may be another. The work is under the direct supervision of Dr. David T. Day. A large plant has been erected at Portland, Ore., and mining men and others are offering enthusiastic assistance in furnishing samples and material for the tests. The Dings Electro-Magnetic Separator Company of Milwaukee, has contributed the use of one of their Magnetic Separators and various other concentrating devices are already installed.

Seldner & Enequist, manufacturing chemists, at present located at the corner of Leonard and Richardson streets, Brooklyn, N. Y., have just given out the contracts for the erection of their new factory on Hausman street, Brooklyn. Their new location covers eight city lots and will give them ample facilities to take care of their rapidly expanding trade. Their soldering fluids have met with a deservedly favorable reception, as they have studied the question from the standpoint of the consumer and prepare the fluids of varying strengths and character as best suited for use on tin, brass, copper and galvanized iron. In adtion to soldering fluids this firm manufactures a number of other chemicals for metal workers, such as concentrated lye, sulphurets of potash and ammonia, chlorides of iron and antimony, etc. Any inquiries addressed to them will meet with prompt attention.

The Meriden Machine Tool Company of Meriden, Conn., manufacturers of forming lathes, are now undergoing a reorganization which, when completed, will enable this company once more to become active builders of machine tools. The capital stock of $20,000, all common, held by the old stockholders, was reduced to $5,000. A syndicate then subscribed $15,000 and increased the capital stock again to $20,000, all preferred. There was then issued $44,000 in common stock. The following is a list of the subscribers to the capital stock: James H. White, Henry E. Fairchild, Eugene A. Hall, Frank D. Smith, Henry Dryhurst, George E. Bicknell, H. Wales Lines, all of Meriden, Conn.; Gen. Phillips Montgomery and Frank L. Stiles, New Haven, Conn.; Langdon J. Peck, Kensington, Conn.; Joseph C. Hammon, Rockville, Conn.; Wood Brothers, Fannie L. Clark and John Hoyt, Pittsfield, Mass.; John Johnston, Pawtucket, R. I. Officers will be elected early in April.

Wm. T. Nicholson, Jr., of Providence, R. I., has obtained a position with the Stanley Doggett Company, of 101 Beekman Street, New York, who manufactures parting compounds. Mr. Nicholson will be the Eastern representative, with headquarters at Providence.

Among the proposals of the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., are the following: Schedule 440, foundry facings; schedule 442, copper tubes; schedule 443, bar and sheet copper, ingot copper, brass tubing; schedule 445, brass rod, galvanized sheet steel, ingot copper; schedule 446, molding sand, manganese bronze, brass rod; schedule 447, pig tin, ingot copper, brass rod, high-pressure packing, brass and iron pipe fittings. Bids on the above are to be opened April 17. Further particulars may be had from the bureau.

ROLLING MILLS

Still another new brass and copper rolling mill is projected, but the enterprise as yet exists only on the papers drawn up for incorporation.

The new Michigan Copper and Brass Company, of Detroit, Mich., will break ground early in April for the erection of their plant. The blue prints and specifications for the building are in the hands of the contractors.

The new rolling mill which was to be established in Waterbury by Frank P. Welton, Robert S. Summer and Abel Kenworthy, will probably be called the Waterbury Rolling Mill instead of the Waterbury Metal Company. The projectors expect to break ground for the plant this spring.

It has been reported that the Chicago Brass Company, Kenosha, Wis., is building a million dollar plant for the manufacture of tubing. The company advises that "while we are building a new tube mill there is nothing of special interest regarding it to report at this time, and it is impossible for us to state at all accurately when it will be in operation."

The increase noted in a recent issue of THE METAL INDUSTRY in the plant of the Phenix Tube Company, Brooklyn, N. Y., was entirely in the lock-joint department, the capacity of which was doubled. The company has now started to double the capacity of the furnaces in the brazed department, which will be completed in about a month. With a capacity of 1,000,000 feet per month the mill now makes three kinds of iron lined brass tubes, viz., lock-joint, brazed and close-joint.

The Riverside Metal Company, Riverside, N. J., are making extensive enlargements in their plant in order to further increase their facilities for the manufacture of German silver, phosphor bronze, sheet, rod and wire. Already there has been completed a 105 x 205 foot rolling mill at a cost of $25,000 for the building itself and $75,000 for power plant and special machinery, which will be used chiefly to make phosphor bronze. There is now in the course of construction a $20,000 plant, 115 x 150 feet, to be devoted to the slitting and stamping of German silver, and plans are under consideration which cover additional foundry and office facilities.

NEW CATALOGUES

The Thurston Manufacturing Company, Providence, R. I., have issued a catalogue of their Die Milling Machines.

Henderson Brothers, Waterbury, have issued catalogue No. 8, which shows a very complete line of tumbling barrels.

A. M. Hill, New Haven, Conn., has issued a 28-page catalogue illustrating and describing his ore crusher for the extraction of metal from foundry ashes and skimmings.

The Dow Chemical Company, Mansfield, O., have an 8-page circular of complete electro-plating outfits. There are about 20 such described, ranging from 35 to 600 gallons in nickel, 35 to 100 gallons in copper or brass, 4 to 50 gallons in silver, and ½ and 1 gallon in gold.

"Automatic Annealing of Metals" is the title of the Bates & Peard Annealing Furnace Company's new 32-page catalogue. By cuts and reading matter various types of these furnaces are fully described. C. M. Dally, 29 Broadway, New York, is the American representative for the company.

The New Jersey Aluminum Company's Catalogue No. 3 is an attractive 68-page, illustrated collection of aluminum novelties of all kinds, and automobile castings. Many of those shown might well be used as advertising novelties by some of our readers, such as, for instance, rules, letter openers, stamp boxes, calendars, memo. books, trays, etc.

FIRES

Fire damaged the brass foundry of J. N. Tallman & Sons, Hamilton, Ontario, Canada, to the extent of $2,500. The loss was adjusted as follows: Stock and machinery, $1,483; building, $978.

The J. H. Gautier & Company's crucible works were seriously damaged by fire March 24, but in a circular letter under date of March 28, the company advise that "after the temporary erections planned, we see no reason why we should not receive and deliver orders within ninety days and probably sooner."

ASSOCIATIONS

Secretary Richard Moldenke announces that the tenth convention of the American Foundrymen's Association will be held in Cleveland, O., June 5, 6 and 7, and all foundrymen are invited to attend.

A meeting of the Connecticut Valley Metal Trades Association was recently held at Springfield, Mass., with an attendance of 50 members. The address of the occasion was given by S. M. Green, of Holyoke, Mass., on "Power and Transmission."

The Cincinnati Metal Trades Association, Cincinnati, O., recently voted against a proposed plan to merge with the National Founders' Association because of the great difference in the conditions surrounding the two organizations. The members were, however, in favor of a closer working affiliation.

On Wednesday, March 14, there was held at the Hartford Club, Hartford, Conn., the regular monthly meeting of the New England Foundrymen's Association. The papers read were: "Maintenance, Storage and Valuation of Patterns" and "The Best Means of Advancing High-Grade Mechanics." Representatives were present from a number of the large brass foundries.

The February meeting of the National Brass Manufacturers' Association was held February 14 at Washington, D. C. Representatives from twenty-five of the largest manufacturers of plumbers' brass goods in the United States attended, and the following actions were taken. Prices were advanced 5 per cent.; a standing committee on membership was appointed consisting of J. J. Ryan, Chicago, Ill.; W. Ivy, St. Louis, Mo.; J. H. Glauber, Cleveland, O.; A. S. Hills, Haydenville, Mass.; H. Stein, New York. A report of the Cost Committee was adopted, ordered published and sent to manufacturers. In response to the roll call for information on three important questions, the sentiment of the meeting was given that, in comparison with a year ago, (1) all the houses were busy, (2) that metals would be higher during the next ninety days, (3) that labor would be higher during the same period. The next meeting will be held in Detroit, Mich., May 6.

PERSONALS

Mr. Arthur V. Davis, secretary and general manager of the Pittsburg Reduction Company, is at present traveling abroad, principally on a pleasure trip.

Mr. D. H. Roberts, of Detroit, Mich., recently visited New York in the interests of his new plant, the Roberts Brass Manufacturing Company, which will be in operation June 1.

Mr. C. L. Ackerson, formerly manager of the brass foundry of the Rochester Car Wheel Works, Rochester, N. Y., is now manager of the Syracuse Aluminum and Bronze Company, Syracuse, N. Y.

Mr. L. G. Delamonthe, formerly with the National Lead Company, is now in charge of the plating department of the Chicago Hardware Company, makers of builders' hardware, at North Chicago, Ill.

Mr. Frank Schutz, brass foundry foreman of the H. Mueller Manufacturing Company, Decatur, Ill., has recently received the St. Louis World's Fair medal which was awarded to him for his work in practical metallurgy.

James Chambers, who for many years had charge of the old metal department of the Mowry & Philips Company of Boston, Mass., has taken an office at 138 Milk Street, Boston, Mass., where he deals in old metals, skimmings and drosses. His experience with the Mowry & Philips Company makes him thoroughly familiar with the old metal business.

NEW YORK, April 2, 1906.

COPPER.—Standard copper in London opened at £79, and with a steady and persistent demand for the metal prices were forced to £84 5s. on the 27th (the highest point reached in many years), and closed at £83 15s., showing a net advance for the month of nearly £5 per ton. The trading has been very heavy and the shorts have had to come in and pay the price and at the same time have put out further lines of futures. £84 for spot copper and £81 for three months is high, but it must be remembered that electrical development in Europe is increasing enormously and the stocks of metal are lower than ever before. Europe has a total visible supply of copper to-day, April 2, 1906, of 9,010 tons, against 16,710 tons a year ago. Advices from Europe to-day are that demand is good and consumption increasing.

In the New York market the domestic consumers have been heavy buyers; the low prices made last month, when we reported some few sales were made as low as 18 cents, had no effect on the larger selling interests, and we are able to report to-day sales of several million pounds to all the large consumers of the country from 18½ to 18¾c. for Lake and 18½ to 18⅝c. for electrolytic for deliveries up to the end of July. There is no premium on spot copper, but nearly all producers are sold ahead pretty close to their output, and the market looks as good and strong as ever. The steamer Hudson from China ports brings 1,100 tons of American copper from China. Europe after staying out of the market for several weeks has been an active buyer, and inquiries are increasing daily. The copper market is in good shape, and it is a pretty well-established fact that consumption of the red metal in the world has for the time being caught up with the production. The only possible setback to the copper market in sight is the general sentimental want of confidence in anything and everything should the coal strike become an established fact.

The exports for the month of March were 16,013 tons against 21,073 tons a year ago; so far the total exports this year are 13,200 less than last year.

At the close we quote the market very strong. Lake, 18⅝ to 18¾c.; electrolytic, 18½ to 18⅝c., with casting brands scarce at 18¼c.

TIN.—The London tin market has shown remarkable strength. Spot tin opened in London at £164 15s., and after touching £161 15s. on the 5th, prices steadily advanced to £168 17s. 6d. on the 30th, and closed at £168 15s., showing a net advance for the month of £4 per ton.

The most important and interesting feature to all consumers of pig tin in the market to-day is the increasing importation and distribution of Chinese tin. This tin is reported by consumers to be good tin and suitable for nearly all purposes. It is not as good

or as pure as Straits or Malacca tin, that runs 99.50 pure, whereas Chinese tin runs 99 pure with about .50 to .75 lead and other impurities, while the price ranges from ½ cent to ¾ cent below the cost of Straits, and this is a big consideration in a market like the present. The market for tin has been fairly active with a good demand from consumers, and although prices have reached the highest on record for recent years, consumption has not been affected. Straits tin to-day, carload lots, $37.60 cash; smaller lots, $37.70. Chinese tin, $36.75 carload lots; smaller lots, $37.00.

LEAD.—Foreign lead opened at £16 2s. 6d., touched £15 10s. on the 7th, and closed at £15 18s. 9d.

There has been no change in the New York price. The trust asks 5.35 New York shipment, and the spot price for carload lots is 5.45 to 5.50.

SPELTER.—London market dull and prices unchanged at £25.

The New York spelter market has been dull again and disappointing. There has been no active demand, and the trade has been listless and not interested. Prices rule about 5.95 to 6 cents in St. Louis, and 6.10 to 6.15 cents asked New York delivery.

ALUMINUM.—The scarcity of aluminum continues, but there is a prospect of an improvement in conditions. The manufacturers of the metal have recently doubled their capacity at their Massena, N. Y., works, and with the coming of spring they will no longer be bothered at this point with ice, which has lessened their water power and curtailed their output. Prices are unchanged.

SILVER.—The London silver market has ruled more or less easy, and prices have worked off slightly, opening at 30 7-16d. and closed at 30d.

The New York market has kept in touch with each advance or decline abroad and closes a shade easier.

SHEET BRASS AND COPPER.—The market for sheet copper and brass has been active, and the larger buyers have placed orders for the next two months. There has been no change in prices at present writing, the present price being based on an 18½ cent lake basis.

OLD METALS.—The old metal market has been active and firmer, the strong copper market has brought in buyers for all kinds of scrap copper and brass, and prices in all lines have been advanced accordingly. The demand is good and the market generally in good shape.

TRADE WANTS

AN EXCHANGE FOR THE WANTS OF THE METAL TRADES.

Advertisements will be inserted under this head at 30 cents per line, 4 lines one dollar, for each insertion. Answers sent in our care will be forwarded.

MACHINERY AND EQUIPMENT.

WANTED—One second-hand ROLLING MILL, about 15-inch rolls. Address, giving price and particulars, J. B. M., care THE METAL INDUSTRY.

FOR SALE.

FOR SALE.—SECOND HAND SAFE in good condition, combination lock. 36 x 26½ x 16 inches inside. Price $75. Address SAFE, care THE METAL INDUSTRY.

FOR SALE—First-class PLANT for gold, silver and nickel PLATING and repairing of silverware; doing a business of $6,000 to $7,000 per year, at an expense of $300 per month; owner wishes to retire from business. For particulars, address M. MEYER, 3640 Wentworth Avenue, Chicago, Ill.

FOR SALE—BRASS FOUNDRY FLASKS; 150 sets iron flasks, 12 x 15 x 5½, four pins, planed face and back, three pour holes, at $1.50 each for the lot. Address W. GISRIEL & SON, Guilford and Girard Avenues, Baltimore, Md.

FOR SALE—10 H. P. Mietz & Weiss OIL ENGINE, direct connected on same base with CLAYTON AIR COMPRESSOR. Perfect condition. Address D. CULHANE, 375 Driggs avenue, Brooklyn, N. Y.

FOR SALE—5 to 10 tons prime remelted SPELTER; also 5,000 pounds TERNE METAL. Quotations upon application. Address P. McLAUGHLIN'S SONS COMPANY, 230-236 North Twelfth street, Brooklyn, N. Y.

HELP WANTED

WANTED—PATTERN MAKER and SHOP CARPENTER; one who is capable of reading drawings and building propeller wheels of any design. Also general jobbing work for a brass foundry. Address PATTERN MAKER, care THE METAL INDUSTRY.

WANTED for our new shop—First class, experienced monitor hands and brass workers; those accustomed to steam work preferred. Apply at the works of the NATHAN MANUFACTURING COMPANY, 416 East 106th street, New York.

WANTED—Man to represent LINSEED OIL HOUSE and to solicit business from the office; must be well qualified to act as representative among the foundrymen. Address, with full qualifications, A. F. F., care THE METAL INDUSTRY.

WANTED—FOREMAN for job POLISHING and PLATING WORKS, to take entire charge of shop; executive ability and full knowledge of the work necessary; state age, experience and salary expected. Address EXECUTIVE, care THE METAL INDUSTRY.

SITUATIONS WANTED.

(Persons answering advertisements under this head should state whether they desire position in Brass or Iron Foundry, their specific branch of Plating or Finishing, etc.)

POSITION desired as FOREMAN by a first-class PLATER; expert on solutions and finishes; understands thoroughly silver deposit on glass and china. Address CHEMIST, care THE METAL INDUSTRY.

SUPERINTENDENT OF SMELTING AND REFINING PLANT for white metals and copper smelting and refining from ore residues, ELECTRO-CHEMIST and ASSAYER, good commercial experience, seeks suitable engagement; A1 credentials. Address EAST, care THE METAL INDUSTRY.

MISCELLANEOUS WANTS.

CASH PAID for old precious metals and minerals in any form. Gas mantle dust, bronze powder, bismuth, platinum, mercury, nickel, etc. Address JOSEF RADNAI, 284 Pearl street, New York City.

INFORMATION BUREAU

Subscribers intending to purchase metals, machinery and supplies and desiring the names of the various manufacturers and sellers of these products can obtain the desired information by writing to THE METAL INDUSTRY. Our Information Bureau is for the purpose of answering questions of all kinds. Send for circular.

HEADQUARTERS.

When visiting New York, the out-of-town friends of THE METAL INDUSTRY are invited to make our office their headquarters, where a writing desk and telephone service will be at their disposal. Every one interested in the non-ferrous metals and alloys is invited to call.

Metal Prices, April 4, 1906

METALS.	Price per lb.
COPPER, PIG, BAR AND INGOT AND OLD COPPER Duty Free. Manufactured 2½c. per lb.	
Lake, car load lots	18.75
Electrolytic, car load lots	18.60
Casting, car load lots	18.25
TIN—Duty Free.	
Straits of Malacca, car load lots	38.25
LEAD—Duty Pigs, Bars and Old 2⅛c. per lb.; pipe and sheets 2½c. per lb.	
Pig Lead, car load lots	5.45
SPELTER—Duty 1½c. per lb.	
Western car load lots	6.15
ALUMINUM—Duty Crude, 8c. per lb. Plates, sheets, bars and rods 13c. per lb.	
Small lots	38.00
100 lb lots	36.00
Ton lots	35.00
ANTIMONY—Duty ¾c. per lb.	
Cooksons, cask lots	16.50
Hallets, cask lots	15.75
Other, cask lots	15.50
NICKEL—Duty 6c. per lb.	
Large lots	.45 to .50
Small lots	.50 to .65
MANGANESE—Duty 20%	.75
MAGNESIUM—Duty Free	$1.50 to $1.75
BISMUTH—Duty Free	1.50 to 1.60
CADMIUM—Duty Free	.95 to 1.00
PHOSPHORUS—Duty 18c. per lb.	
Large lots	.42
Small lots	.50 to .75
	Price per oz.
GOLD—Duty Free	$20.67
SILVER—Duty Free	.64
PLATINUM—Duty Free	24.00
QUICKSILVER—Duty 7c. per lb. Price per Flask	41.00

OLD METALS.		Price per lb.
Heavy Cut Copper	16.50	17.50
Copper Wire	16.00	17.25
Light Copper	15.00	15.50
Heavy Mach. Comp	14.25	15.50
Heavy Brass	11.00	12.00
Light Brass	9.00	10.25
No. 1 Yellow Brass Turnings	10.00	10.75
No. 1 Comp. Turnings	12.00	13.00
Heavy Lead	4.85	5.10
Zinc Scrap	4.50	5.00
Scrap Aluminum, sheet, pure	25.00	29.00
Scrap Aluminum, cast, alloyed	20.00	25.00
Scrap Aluminum, turnings	10.00	12.00
Old Nickel	15.00	25.00
No. 1 Pewter	26.00	27.00

	Price per lb.
SILICON COPPER, according to quantity	.36 to .38
PHOSPHOR COPPER, 5%	.24 to .26
Phosphor Tin	.41 to .43
Brass Ingot, Yellow	.13 to .14
Brass Ingot, Red	.15 to .18
Bronze Ingot	.16 to .17
Manganese Bronze	.20 to .21
Phosphor Bronze	.20 to .21

ZINC—Duty, sheet, 2c. per lb.	Price per lb.
600 lb. casks	8.50
Open casks	9.00

PRICES OF SHEET COPPER.

SIZES OF SHEETS.		96oz. & over 75 lb. sheet 30x60 and heavier	64oz. to 96oz. 50 to 75 lb. sheet 30x60	32oz. to 64oz. 25 to 50 lb. sheet 30x60	24oz. to 32oz. 18¾ to 25 lb. sheet 30x60	16oz. to 24oz. 12½ to 18¾ lb. sheet 30x60	14oz. and 15oz. 11 to 12½ lb. sheet 30x60
		CENTS PER POUND.					
Not wider than 30 ins.	Not longer than 72 ins.	23	23	23	23	23	24
	Longer than 72 ins. Not longer than 96 ins.	23	23	23	23	23	24
	Longer than 96 ins.	23	23	23	23	23	25
Wider than 30 ins. but not wider than 36 ins.	Not longer than 72 ins.	23	23	23	23	23	25
	Longer than 72 ins. Not longer than 96 ins.	23	23	23	23	23	25
	Longer than 96 ins. Not longer than 120 ins.	23	23	23	23	24	26
	Longer than 120 ins.	23	23	23	24	25	
Wider than 36 ins. but not wider than 48 ins.	Not longer than 72 ins.	23	23	23	24	25	27
	Longer than 72 ins. Not longer than 96 ins.	23	23	23	24	26	28
	Longer than 96 ins. Not longer than 120 ins.	23	23	23	25	27	31
	Longer than 120 ins.	23	23	24	26	29	
Wider than 48 ins. but not wider than 60 ins.	Not longer than 72 ins.	23	23	23	24	26	29
	Longer than 72 ins. Not longer than 96 ins.	23	23	23	25	27	32
	Longer than 96 ins. Not longer than 120 ins.	23	23	24	26	29	
	Longer than 120 ins.	24	24	25	27	31	
Wider than 60 ins. but not wider than 72 ins.	Not longer than 96 ins.	23	23	24	26	31	
	Longer than 96 ins. Not longer than 120 ins.	23	23	25	28	33	
	Longer than 120 ins.	24	24	26	31		
Wider than 72 ins. but not wider than 108 ins.	Not longer than 96 ins.	24	24	26	29		
	Longer than 96 ins. Not longer than 120 ins.	25	25	27	30		
	Longer than 120 ins.	26	26	28	32		
Wider than 108 ins.	Not longer than 132 ins.	27	27	29			
	Longer than 132 ins.	28	28	31			

Rolled Round Copper, ⅝ inch diameter or over, 23 cents per pound. (Cold Drawn, Square and Special Shapes, extra.)

Circles, Segments and Pattern Sheets three (3) cents per pound advance over prices of Sheet Copper required to cut them from.

All Cold or Hard Rolled Copper, 14 ounces per square foot and heavier, one (1) cent per pound over the foregoing prices.

All Cold or Hard Rolled Copper, lighter than 14 ounces per square foot, two (2) cents per pound over the foregoing prices.

Cold Rolled and Annealed Copper, Sheets and Circles, wider than 17 inches, take the same price as Cold or Hard Rolled Copper of corresponding dimensions and thickness.

All Polished Copper, 20 inches wide and under, one (1) cent per pound advance over the price for Cold Rolled Copper.

All Polished Copper, over 20 inches wide, two (2) cents per pound advance over the price for Cold Rolled Copper.

Planished Copper, one (1) cent per pound more than Polished Copper.

Cold Rolled Copper prepared suitable for polishing, same prices and extras as Polished Copper.

Tinning Sheets, on one side, 2½c. per square foot.

For tinning both sides, double the above price.

For tinning the edge of sheets, one or both sides, price shall be the same as for tinning all of one side of the specified sheet.

Metal Prices, April 4, 1906

Net Cash Prices.

COPPER BOTTOMS, PITS AND FLATS.

14 oz. to square foot, and heavier, per lb.....27c.
12 oz. and up to 14 oz. to square foot, per lb.....28c.
Lighter than 10 oz.....33c.
10 oz. and up to 12 oz.....30c.
Circle less than 8 in. diam., 2c. per lb. additional.
Circles over 13 in. diam. are not classed as Copper Bottoms.
Polished Copper Bottoms and Flats, 1c. per lb. extra.

PRICE LIST FOR ROLL AND SHEET BRASS.

Prices are for 100 lbs. or more of Sheet Metal in one order.

Brown & Sharpe's Gauge the Standard.

Common High Brass	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
Wider than and	2	12	14	16	18	20	22	24	26	28
including	12	14	16	18	20	22	24	26	28	30
To No. 20 inclusive..	.22	.23	.25	.27	.29	.31	.33	.36	.39	.42
Nos. 21, 22, 23 and 24	.22	.24	.26	.28	.30	.32	.34	.37	.40	.43
Nos. 25 and 26.....	.23	.24½	.27	.29	.31	.33	.35	.38	.41	.44
Nos. 27 and 28.....	.23	.25	.28	.30	.32	.34	.36	.39	.42	.45

Add ½ cent per lb. additional for each number thinner than Nos. 28 to 38, inclusive.

Add 7 cents per lb. for sheets cut to particular lengths, not sawed, of proportionate width.

Add for polishing on one side, 40 cents per square foot; on both sides, double this price.

Brazing, Spinning and Spring Brass, 1 cent more than Common High Brass.

Extra Quality Brazing, Spinning and Spring Brass, 2 cents more than Common High Brass.

Low Brass, 4 cents per lb. more than Common High Brass.

Gilding, Rich Gold Medal and Bronze, 7 cents per lb. more than Common High Brass.

Discount from list 17½ per cent.

PRICE LIST FOR BRASS AND COPPER WIRE.

BROWN & SHARPE'S GAUGE THE STANDARD.	Com. High Brass.	Low Brass.	Gilding Bronze and Copper.
All Nos. to No. 10, Inc.....	$0.23	$0.27	$0.28
Above No. 10 to No. 16.....	.23½	.27½	.28½
Nos. 17 and 18.....	.24	.28	.32
" 19 and 20.....	.25	.29	.33
No. 21.....	.26	.30	.34
" 22.....	.27	.31	.35
" 23.....	.28	.32	.36
" 24.....	.30	.34	.38

Discount, Brass Wire, 15 and 2½ per cent.; Copper Wire, 15 and 2½ per cent.

PRICES FOR SEAMLESS BRASS TUBING.

From 1¼ in. to 3½ in. O. D. Nos. 4 to 13 Stubs Gauge, 22c. per lb.
Seamless Copper Tubing, 25c. per lb.

For other sizes see Manufacturers' List.

PRICES FOR SEAMLESS BRASS TUBING Iron Pipe Sizes.

Iron Pipe size.	⅛	¼	⅜	½	¾	1	1¼	1½	2	2½	3	3½	4	4½	5	6
Price per lb..	30	29	24	23	22	22	22	22	22	22	22	23	24	26	28	29

BRAZED BRASS TUBING.

Brown & Sharpe's Gauge the Standard.

	Per lb.
Plain Round Tube, ⅜ in. up to 2 in., to No. 19, inc.....	$0.35
" " " ⅜ " " ¾ " " 19, "	.36
" " " ½ " " ¾ " " 19, "	.38
" " " ⅝ " " ½ " " 19, "	.41
" " " ⅝ " " ⅝ " " 19, "	.48
" " " ¾ " " ⅞ " " 19, "	.65
" " " ⅞ " " 1¼ " " 19, "	1.00
" " " 1⅛ " " 1¼ " " 19, "	1.50
Smaller than ⅛ inch.....	Special
2 inch to 3 inch, to No. 19, inclusive.....	.38
3 inch	.40
Over 3 inch to 3½ inch.....	.45
Over 3½ inch.....	.50

Bronze and copper advance 3 cents. Discount 25 and 5 per cent.

PRICE LIST FOR SHEET ALUMINUM—B. & S. Gauge.

Wider than and including	*3in. 12in. in coils.	6in. 14in.	14in. 16in.	16in. 18in.	18in. 20in.	20in. 24in.	24in. 30in.	30in. 36in.	36in. 40in.	Cutting to Length.	Polishing or Satin Finishing one Side.
W. 13 and heavier..	44	44	46	46	46	46	49	49	49	1	2
" 14.....	44	44	46	46	46	46	49	49	49	1	2
" 15.....	44	44	46	46	46	46	49	49	49	1	2
" 16.....	44	44	46	46	46	46	49	49	49	1	2
" 17.....	44	44	46	46	46	46	49	49	49	1	3
" 18.....	44	44	46	46	46	46	49	49	52	1	3
" 19.....	44	44	46	46	46	46	49	50	53	1	4
" 20.....	44	46	46	46	46	48	51	52	54	1	4
" 21.....	44	48	48	48	48	50	53	54	60	2	5
" 22.....	44	48	48	48	50	50	53	57	61	2	5
" 23.....	44	48	48	48	50	50	53	59	62	2	6
" 24.....	44	48	50	52	52	52	55	61	64	2	6
" 25.....	46	49	51	53	53	53	56	63	67	2	7
" 26.....	46	49	52	56	56	56	61	65	71	2	8
" 27.....	46	50	54	58	58	59	64	68	74	2	10
" 28.....	46	50	56	58	59	59	66	72	77	2	11
" 29.....	48	51	58	60	62	62	71	77	82	2	13
" 30.....	48	52	60	62	66	72	79	82	87	2	15
" 31.....	50	54	62	65	70	78	81	84	90	3	17
" 32.....	52	56	64	68	76	84	91	97	102	3	19
" 33.....	54	58	67	72	80	91	98	107	117	3	21
" 34.....	57	62	69	77	85	98	110	117	127	3	25
" 35.....	..	72	77	87	97	107	122	132	..	..	.. *
" 36.....	..	87	97	107	122	127	142	..	..	..	..
" 37.....	..	102	112	127	142	157	172	..	..	..	..
" 38.....	..	122	137	152	167	182	202	..	..	..	..
" 39.....	..	142	162	182	202	222	..	..	..	..	..
" 40.....	..	172	202	222	242	..	..	..	..	..	..

*Polished or scratch brushed 2 sides, double above prices.

In flat rolled sheets the above prices refer to lengths between 2 and 8 feet. Prices furnished by the manufacturers for wider and narrower sheet. All columns except the first refer to flat rolled sheet. Prices are for 50 lbs. or more at one time. Less quantities 5c. lb. extra. Charges made for boxing.

PRICE LIST OF SEAMLESS ALUMINUM TUBING—STUBS' GAUGE.

Stubs' G.	⅛"	¼"	⅜"	½"	⅝"	¾"	1"	1½"	2"	2½"	2¾"
4 to 11....	..	..	96	86	83	77	67	61	61	61	
12.....	..	1.08	96	86	83	77	67	61	61	61	
13.....	..	1.08	96	86	83	77	67	64	64	64	
14.....	..	1.08	96	86	83	77	67	64	64	64	
15.....	..	1.12	96	89	86	80	70	67	67	67	
16.....	..	1.15	99	93	89	83	70	70	70	70	
17.....	..	1.18	1.02	96	93	86	73	73	73	73	
18.....	1.85	1.24	1.05	99	93	86	77	77	77	80	
19.....	1.88	1.28	1.08	1.02	99	93	83	80	80	83	
20.....	1.95	1.31	1.15	1.08	1.05	99	89	86	86	89	
21.....	2.01	1.37	1.21	1.15	1.12	1.05	99	93	93	96	
22.....	2.17	1.44	1.24	1.18	1.15	1.08	1.05	99	1.05	1.05	
23.....	2.33	1.50	1.31	1.24	1.21	1.15	1.15	1.08	1.15	1.15	
24.....	2.48	1.60	1.37	1.31	1.28	1.18	1.21	1.21	1.24	..	
25.....	2.65	1.69	1.47	1.37	1.34	1.28	1.34	..	..	..	

Prices are for lots of 50 lbs. Boxing extra. Smaller, larger and intermediate sizes furnished by manufacturers.

PRICE LIST FOR ALUMINUM ROD AND WIRE—B. & S. GAUGE.

Diameter B. & S. G'ge.	0000 to No. 10.	No. 11.	No. 12.	No. 13.	No. 14.	No. 15.	No. 16.	No. 17.	No. 18.	No. 19.	No. 20.	No. 21.	No. 22.
Price, per lb....	40	40½	40½	41	41½	42	42½	43	44	45	46	49	54

200 lbs. to 30,000 lbs., 3 cents off list; 30,000 lbs. and over, 4 cents off list.

PRICE LIST FOR GERMAN SILVER IN SHEETS AND ROLLS.

Per cent.	Price per lb.	Per cent.	Price per lb.
12.....	$0.52	16.....	.58
13.....	.53	17.....	.59
14.....	.54	18.....	.60
15.....	.55		

These prices are for sheets and rolls over 2 inches in width, to and including 8 inches in width and to No. 20, inclusive, American or Brown & Sharpe's Gauge. Prices are for 100 lbs. or more of one size and gauge in one order. Discount 50 per cent.

Munts or Yellow Metal Sheathing (14" x 48") .....18c. lb. net base.
" " " Rectangular Sheets other than Sheathing ....20c. " " "
" " " Rod ....19c. " " "
Tobin Bronze Rod..... ... .21c. " " "
Above are for 100 lbs. or more in one order.